REPORT NUMBER: NCAP-CAL-17-006

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

Fuji Heavy Industries LTD
2017 Subaru Impreza
Four Door Sedan

NHTSA No: O20175500

PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
BUFFALO, NEW YORK 104625

March 24, 2017

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590

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Prepared by: Vanessa Hansen Date: March 24, 2017
Vanessa Hansen, Senior Test Engineer

Approved by: Edward Dutton Date: March 24, 2017
Edward J. Dutton, Operations Manager
Transportation Test Operations

FINAL REPORT ACCEPTANCE BY OCWS:

_____
Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

_____
COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

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15. Supplementary Notes		

16. Abstract

A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2017 Subaru Impreza four door sedan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 22, 2017.

The impact velocity of the vehicle was 56.47 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 473 mm at the vehicle's centerline. The test vehicle's occupant performance data is as follows:

Measurement Description	Units	Driver ATD (Serial No. 1046)		Passenger ATD (Serial No. 288)	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})		700	260.681	700	167.717
Maximum Chest Compression	mm	63	-23.041	52	-17.526
Nij		1	0.305	1	0.324
Neck Tension	N	4,170	1135.068	2,620	732.986
Neck Compression	N	4,000	-383.595	2,520	-382.803
Left Femur Force	N	10,008	-1552.964	6,805	-722.937
Right Femur Force	N	10,008	-2141.780	6,805	-693.924

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Form DOT F1700.7 (8-69)

TABLE OF CONTENTS

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00260. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test procedure, dated October 2015.

SUMMARY

A ridged fixed barrier was impacted by a 2017 Subaru Impreza four door sedan at a velocity of 56.47 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 22, 2017. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 14 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right / left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 1046) and the right-front passenger (position 2) ATD (Serial No. 288) were calibrated previous to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 136 channels of data were recorded on an on-board data acquisition system. Please refer to Appendix B for the dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of stoddard solvent leakage after

the event and including all phases of the static rollover. The maximum static crush of the test vehicle was 473 mm at the vehicle's centerline. During and after the impact event, the driver's and passenger's side doors were closed and operational.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee air bag.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the glove box.

The occupant data is summarized below.

ATD Position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50^{th})	260.681	0.305	1135.068	-383.595	46.729	-23.041	-1552.964	-2141.780
Passenger (5^{th})	167.717	0.324	732.986	-382.803	43.956	-17.526	-722.937	-693.924

GENERAL COMMENTS:

1. P1 (Driver) serial number - 1046
2. P2 (Passenger) serial number - 288

Data Anomalies:

- Passenger Lap Force, Questionable Data Throughout

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of FMVSS 212, 219 (Partial), and 301 Data

Data Sheet No. 16 – FMVSS 301 Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Subaru Impreza four door sedan
NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 2/22/2017

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20175500
Model Year	2017
Make	Subaru
Model	Impreza
Body Style	Four Door Sedan
VIN	4S3GKAL61H3600258
Body Color	Charcoal Gray
Odometer Reading (km /mi)	45.1 km / 28 mi
Engine Displacement (L)	2.0
Type / No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	All Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	No

Traction Control System (TCS)	Yes
Power Steering	Yes
Power Window Auto-Reverse	No
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	No
Driver Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other	-

Does owner's manual provide instructions to turn off automatic door locks? N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	Fuji Heavy Industries LTD.
Date of Manufacture	11/16

GVWR (kg)	1950
GAWR Front (kg)	990
GAWR Rear (kg)	1000

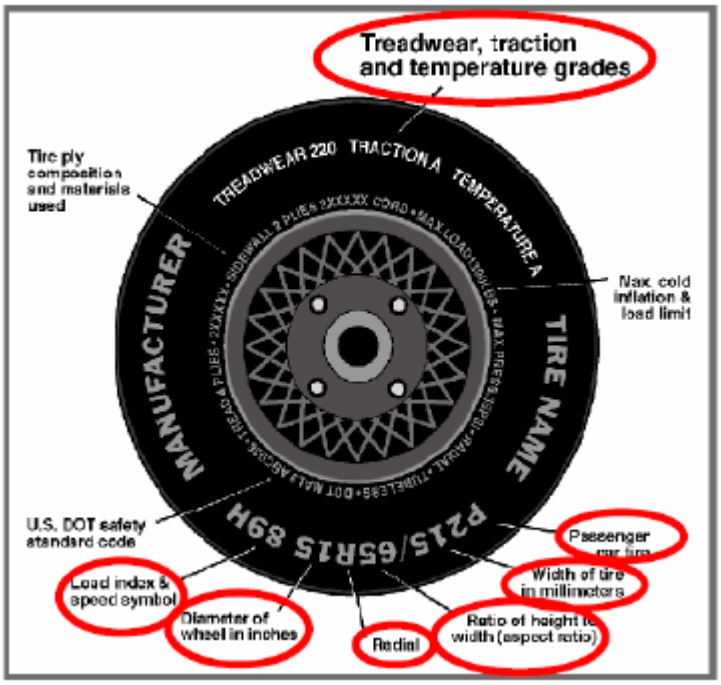
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	-	
Number of Occupants	2	3	-	5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.8

DATA SHEET NO. 1 … (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017

Collect items circled in red, tire manufacturer, and tire name.



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	220
Recommended Tire Size	P225/40R18	P225/40R18
Tire Size on Vehicle	P225/40R18	P225/40R18
Tire Manufacturer	Yokohama	Yokohama
Tire Model	AVID S34	AVID S34
Treadwear	320	320
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 1 Nylon	2 Steel, 2 Polyester, 1 Nylon
Load Index / Speed Symbol	88H	88H
Tire Material	Rubber	Rubber
DOT Safety Code Left	4UT76EX3216	4UT76EX3216
DOT Safety Code Right	4UT76EX3216	4UT76EX3216

DATA SHEET NO. 1 … (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	421	314		461	366	
Right	kg	433	281		466	339	
Ratio	%	59	41		57	43	
Totals	kg	854	595	1449	927	705	1632

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1449	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	147	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1640.8	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	694	699	696	699	1098
As Tested	mm	699	704	675	678	1155
Post-Test	mm	736	738	665	673	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2675
Total Vehicle Length at Left Side	mm	4576
Total Vehicle Length at Centerline	mm	4627
Total Vehicle Length at Right Side	mm	4576
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	40
Amount of Stoddard Solvent in Fuel Tank	L	46.5

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, spare tire, jack, rear seats, tail light

DATA SHEET NO.1 … (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	4627
2	Total Width	1775
3*	Bumper Top Height	476
4*	Bumper Bottom Height	372
5*	Longitudinal Member Top Height	486
6	Distance Between Longitudinal Members	989
7	Longitudinal Member Width	66
8*	Engine Top Height	799
9*	Engine Bottom Height	165
10	Engine and Gearbox Width	742
11	Front Bumper-Engine Distance	506
12*	Front Shock Absorber Fixing Height	820
13*	Bonnet Leading Edge Height	777
14	Front Shock Absorber Fixing Width	1161
15	Front Bumper – Front Axle Distance	958
16	Front Axle – A Pillar Distance	383
17	A-Pillar – B-Pillar Distance	1237
18	B-Pillar – Rear Axle Distance	1056
19	B-Pillar – C-Pillar Distance	978
20*	Roof Sill Bottom Height	1335
21*	Roof Sill Top Height	1390
22*	Floor Sill Bottom Height	235
23*	Floor Sill Top Height	332

*Height Measurements are taken from the ground
Note: All measurements are in millimeters

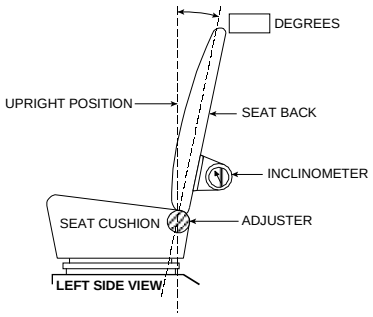
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017

NOMINAL DESIGN RIDING POSITION

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.

Seating Position	Degrees
Driver Seat Back Angle	6.7
Passenger Seat Back Angle	6.0



FRONT SEAT ASSEMBLY

SEAT FORE / AFT POSITIONS

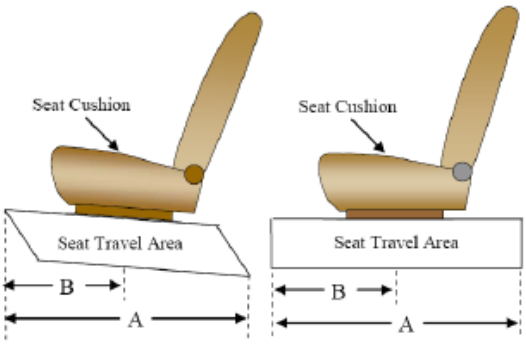
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	27 (0-26)	11
Passenger Seat	27 (0-26)	0

SEAT BELT UPPER ANCHORAGE

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50th percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5th percentile adult female ATD. For this test zero is defined as the uppermost position.

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	4 (0-3)	1
Passenger Seat	4 (0-3)	0 – Uppermost



DATA SHEET NO. 2 … (CONTINUED)
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

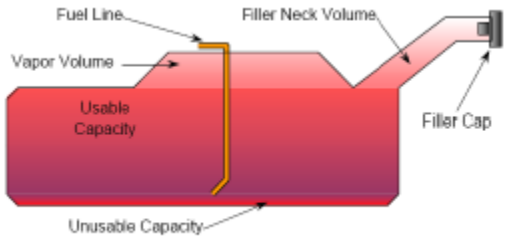
Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	50
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	46 – 47
Actual Amount of Solvent Used	46.5
1/3 of Usable Capacity	16.7

FUEL PUMP

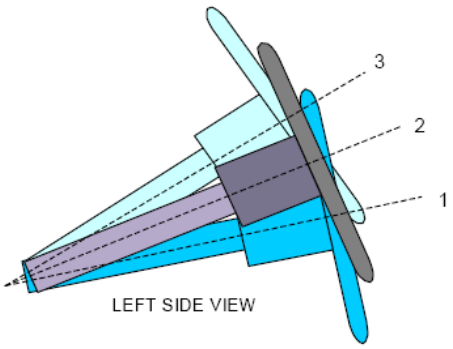
The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the right side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



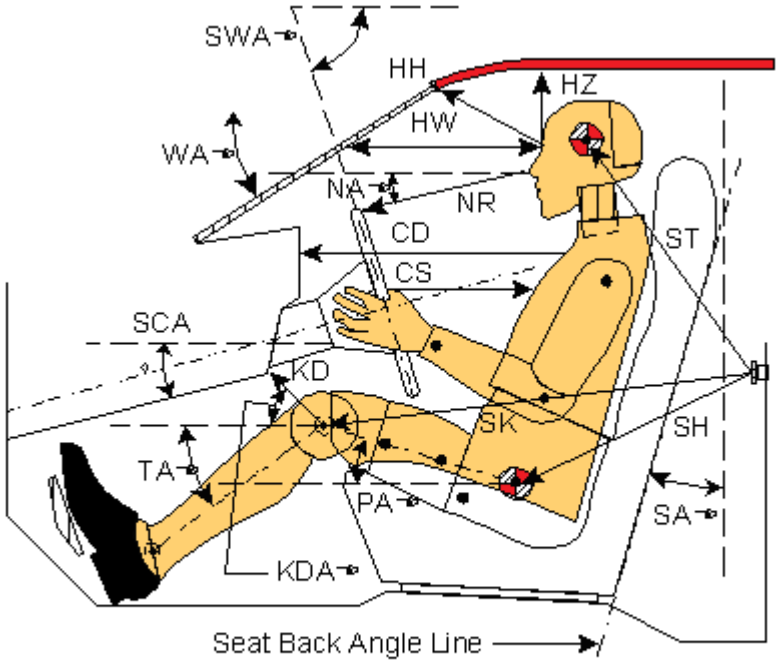
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	21.4	
Geometric center position No. 2	23.1	
Uppermost position No. 3	24.8	
Telescoping Steering Wheel Travel		52
Test Position	23.1	26

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Subaru Impreza four door sedan
NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 2/22/2017



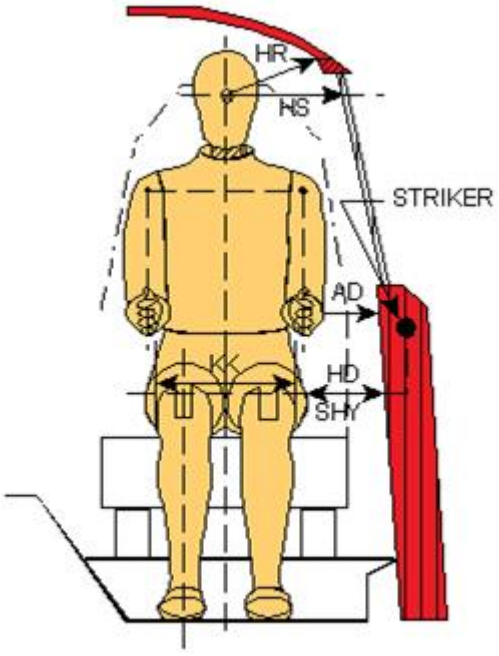
Left Side View

Code	Measurement Description	Driver (SN: 1046)		Passenger (SN: 288)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.4		
SWA°	Steering Wheel Angle		23.7		
SCA°	Steering Column Angle		66.3		
SA°	Seat Back Angle (on headrest post)		6.7		6.9
HZ	Head to Roof (Z)	214	90	200	90
HH	Head to Header	354	30.8	300	54.2
HW	Head to Windshield	685	0	660	0
NR	Nose to Rim	400	7.7	495	29
CD	Chest to Dash	552		432	
CS	Chest to Steering Hub	305	0.2		
RA	Rim to Abdomen	205	0		
KDL	Left Knee to Dash	195	16.6	110	34.2
KDR	Right Knee to Dash	191	16.1	110	35.8
PA°	Pelvic Angle		23.0		21.3
TA°	Tibia Angle		28.2		40
SK	Striker to Knee	633	12.1	715	12.4
ST	Striker to Head	444	75.3	458	51.3
SH	Striker to H-Point	335	41.4	450	28.2

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Subaru Impreza four door sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20175500
Test Date: 2/22/2017

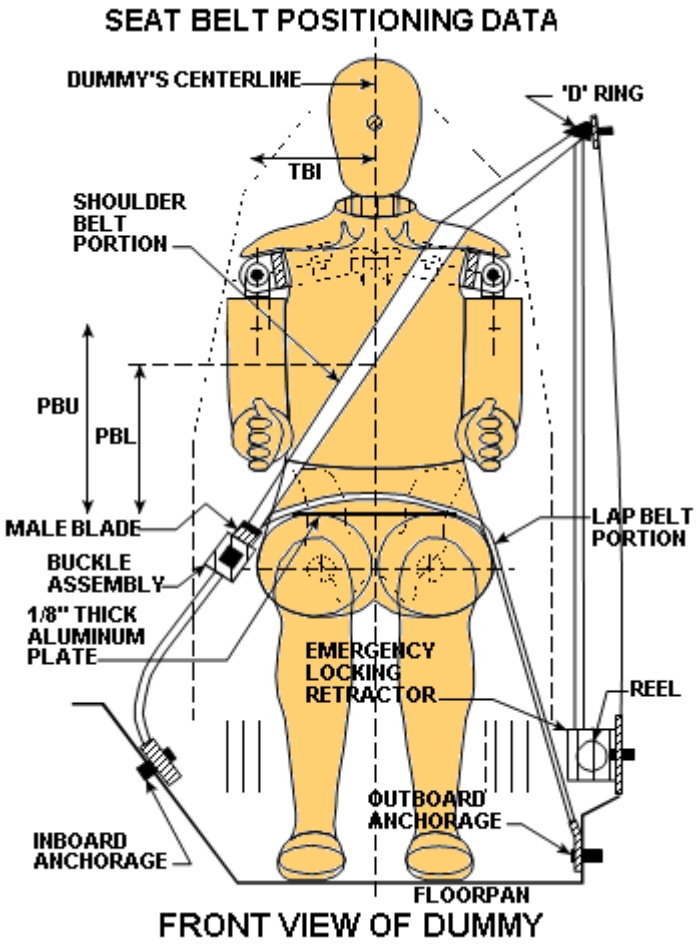


Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	162	93
HD	H-Point to Door	155	193
HR	Head to Side Header	234	272
HS	Head to Side Window	343	374
KK	Knee to Knee	320	165
SHY	Striker to H-Point (Y Direction)	240	255
AA	Ankle to Ankle	328	163

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	345	275
PBL — Top surface of reference to belt lower edge	mm	270	200

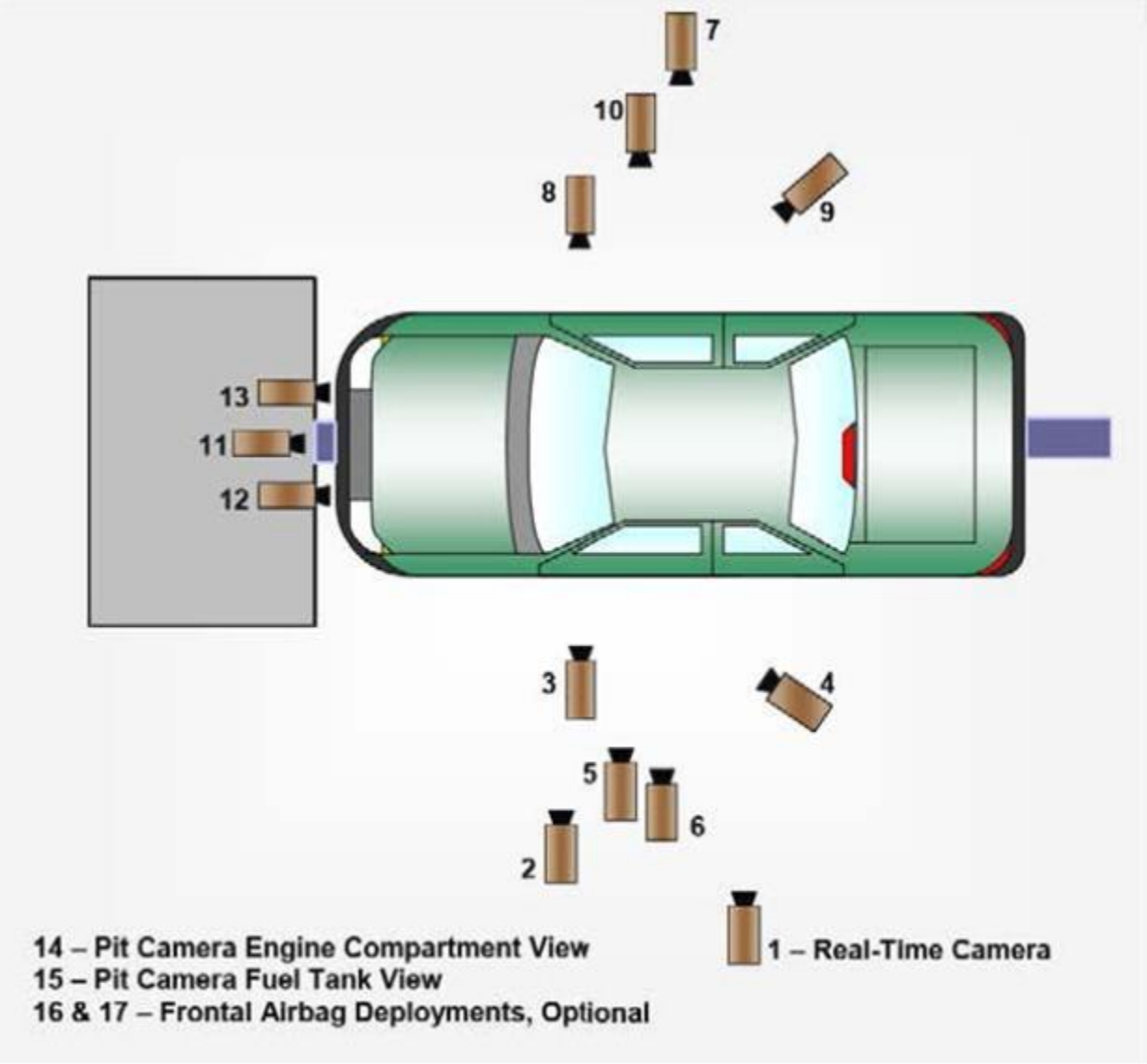
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	825	955
Lap Belt Length as measured on ATD	mm	770	740
Remainder of belt on reel	mm	1005	805
Total belt length for continuous webbing systems	mm	2600	2500

DATA SHEET NO. 6
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

DATA SHEET NO. 6 … (CONTINUED)
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017

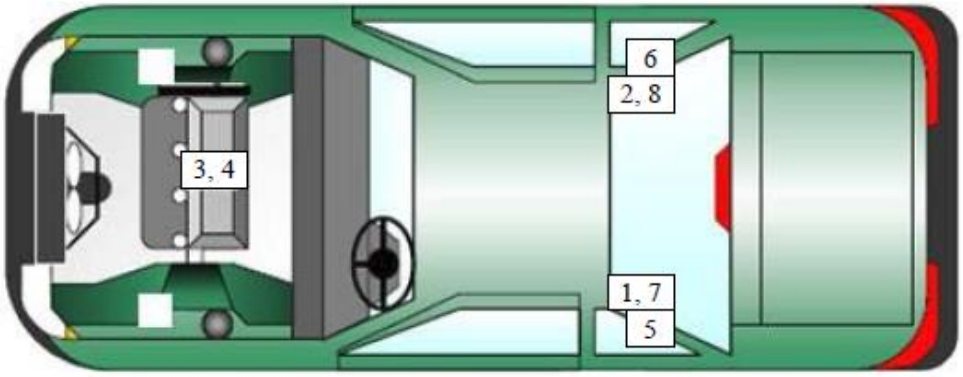
CAMERA LOCATIONS

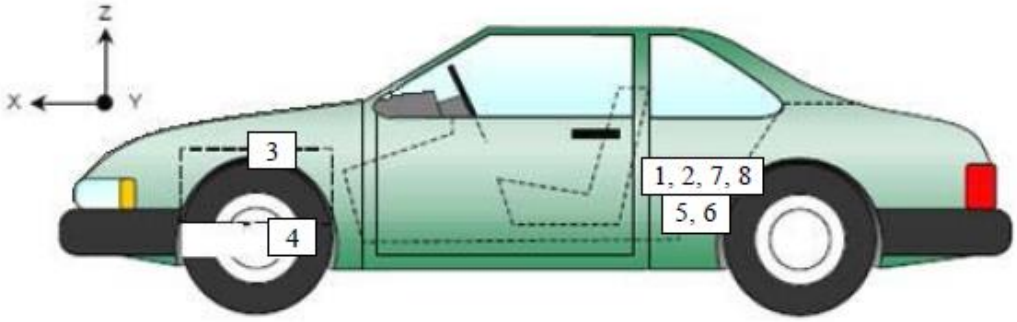
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Driver Close-Up	-1793	-8339	-1472	50	1000
3	Left Front Half	-903	-9054	-1483	50	1000
4	Left Angle	-2880	-2908	-2178	24	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2001	9111	-901	24	1000
8	Passenger Close-Up	-1402	8108	-1181	50	1000
9	Right Front Half	-877	6152	-985	28	1000
10	Right Angle	-2899	3128	-2220	24	1000
11	Windshield	960	0	3505	20	1000
12	Driver Windshield	395	-600	-2051	25	1000
13	Passenger Windshield	395	600	-2051	25	1000
14	Pit Front	-742	0	1775	12.5	1000
15	Pit Rear	-2387	0	2129	12.5	1000
16	Onboard Driver Airbag (Optional)				8	1000
17	Onboard Passenger Airbag (Optional)				8	1000

** COORDINATES:* *+X = forward of impact plane*
+Y = right of monorail center
+Z = into ground

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1832	-305	146
2	Right Rear Accelerometer – X Direction	1836	331	179
3	Engine Top X	3998	-1	-163
4	Engine Bottom X	4246	-18	287
5	Left Rear Accelerometer – Z Direction	1832	-305	146
6	Right Rear Accelerometer – Z Direction	1836	331	179
7	Left Rear Accelerometer – X Direction Redundant	1834	-346	158
8	Right Rear Accelerometer – X Direction Redundant	1839	316	175

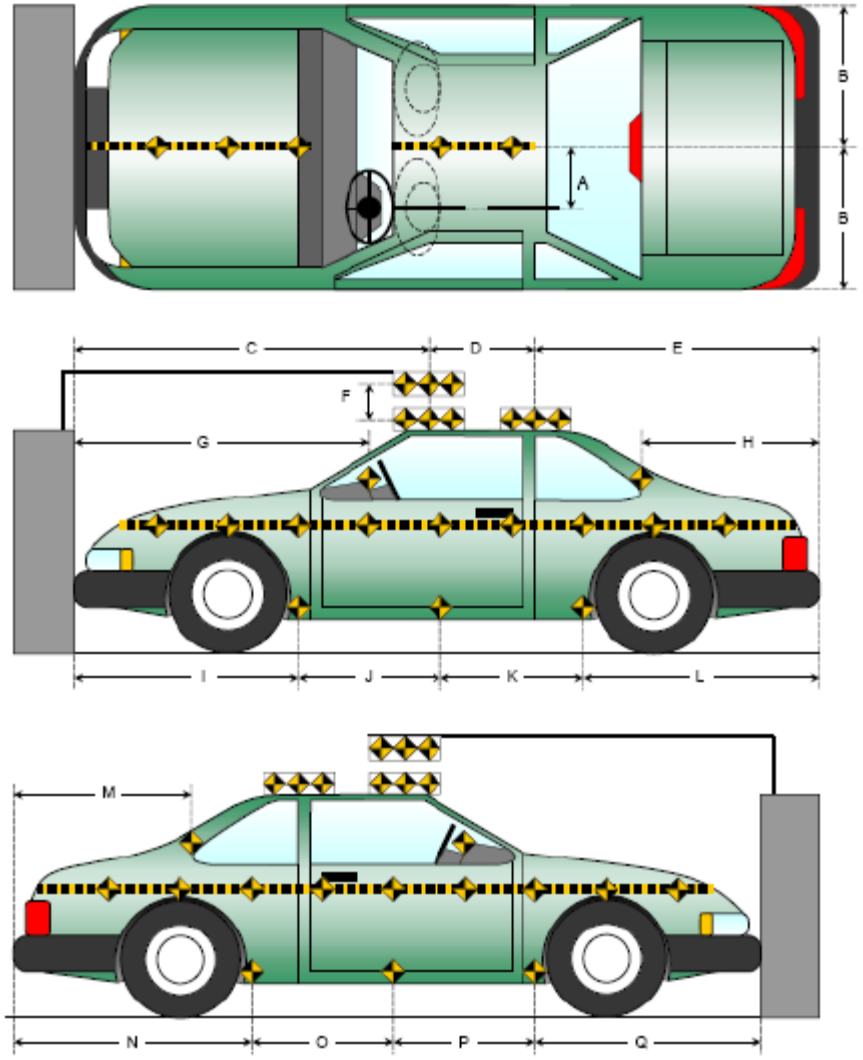
Reference Points: *X – Rear Surface of Vehicle (+ forward)*
Y – Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2017 Subaru Impreza four door sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20175500
Test Date: 2/22/2017

Item	Value
A	339
B	888
C	2722
D	610
E	1296
F	216
G	1766
H	782
I	1391
J	894
K	892
L	1450
M	788
N	1452
O	892
P	894
Q	1390

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017

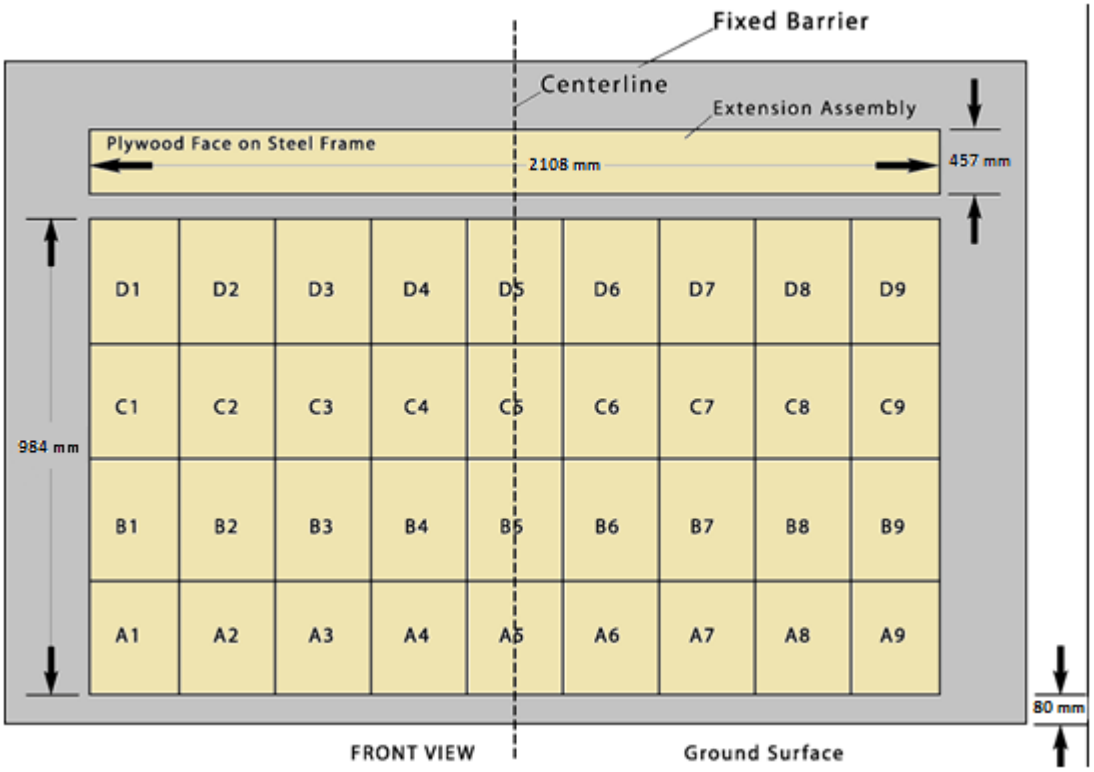


Figure 1 - Load Cell Locations on a 36-Load Cell Barrier with Plywood Height Extension*

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2017 Subaru Impreza four door sedan
NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 2/22/2017

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	46
Passenger Dummy Accelerometers	46
Vehicle Structure Accelerometers	8
Load Cell Barrier	36
Total	136

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	12
Real-Time Panning	1
Total	15

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50th Male / 1046	P5720 5th Female / 288
Head Contact	Front Airbag & Headrest	Front Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	No	No
Glazing Damage	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Remained in good condition
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

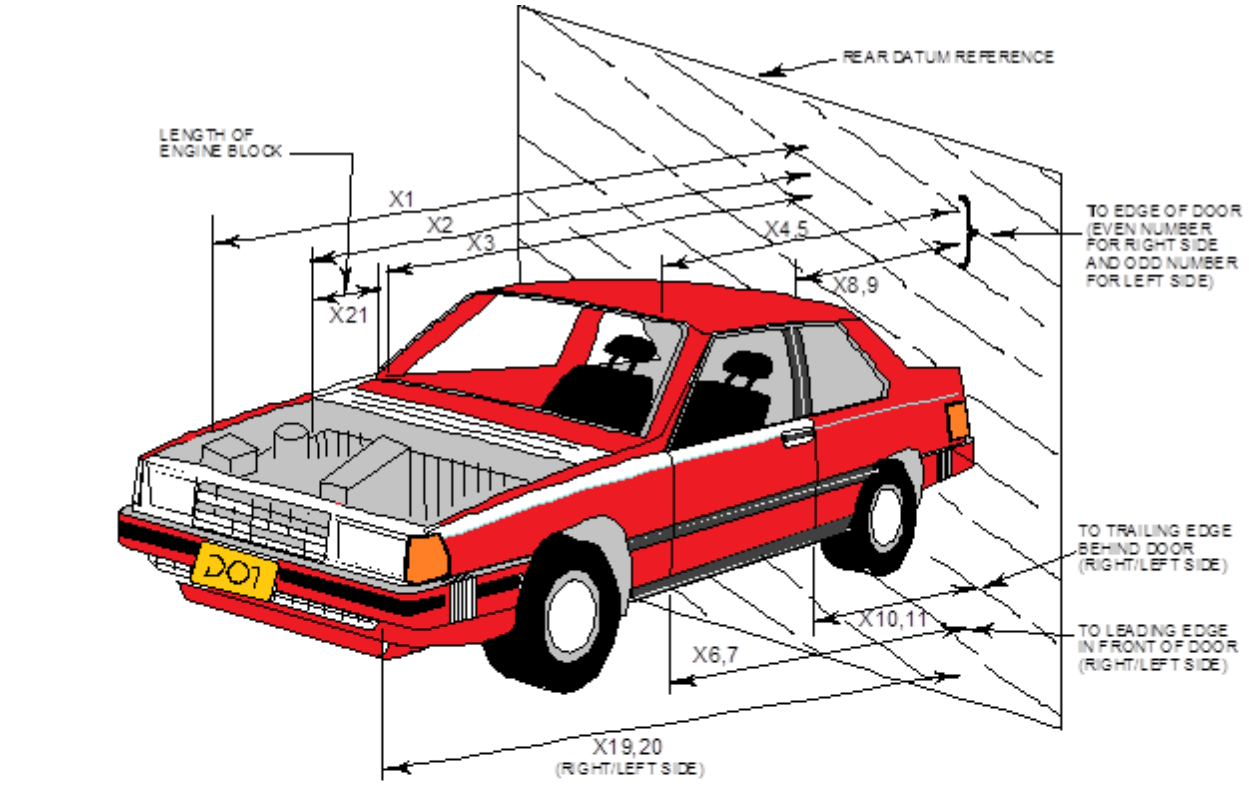
Measured Parameter	Units	Value
Left Side	mm	685
Center	mm	746
Right Side	mm	714
Average	mm	715

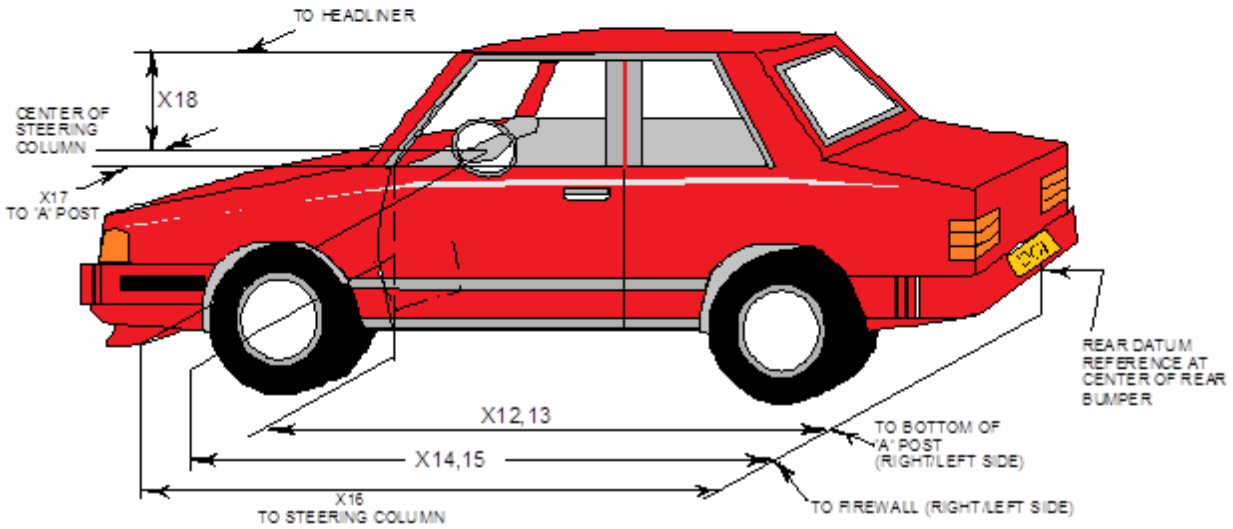
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 - Curtain	Yes	No	Yes	No
Side Airbag 2 - Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017





DATA SHEET NO. 12 … (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4627	4155	-473
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4122	3899	-223
3	RSOV to Firewall	3522	3567	45
4	RSOV to Upper Leading Edge of Right Door	3204	3201	-3
5	RSOV to Upper Leading Edge of Left Door	3202	3200	-2
6	RSOV to Lower Leading Edge of Right Door	3124	3123	-2
7	RSOV to Lower Leading Edge of Left Door	3119	3119	0
8	RSOV to Upper Trailing Edge of Right Door	2055	2057	1
9	RSOV to Upper Trailing Edge of Left Door	2054	2054	0
10	RSOV to Lower Trailing Edge of Right Door	2075	2075	0
11	RSOV to Lower Trailing Edge of Left Door	2074	2076	2
12	RSOV to Bottom of “A” Post of Right Side	3228	3227	-1
13	RSOV to Bottom of “A” Post of Left Side	3228	3228	0
14	RSOV to Firewall, Right Side	3555	3551	-4
15	RSOV to Firewall, Left Side	3554	3550	-4
16	RSOV to Steering Column	2690	2746	56
17	Center of Steering Column to “A” Post	302	288	-14
18	Center of Steering Column to Headliner	423	438	15
19	RSOV to Right Side of Front Bumper	4611	4186	-425
20	RSOV to Left Side of Front Bumper	4610	4199	-411
21	Length of Engine Block	362	362	0
RD	RSOV to Right Side of Dash Panel	2921	2919	-1
CD	RSOV to Center of Dash Panel	2837	2839	2
LD	RSOV to Left Side of Dash Panel	2921	2920	-1

*UR= Unrecoverable data point
All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

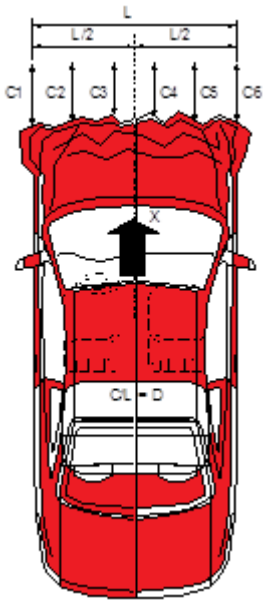
Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017

VEHICLE INFORMATION

VIN:	4S3GKAL61H3600258	Wheelbase (mm):	2675
Vehicle Size Category:	Passenger	Test Weight (kg):	1632

ACCELEROMETER DATA

Accelerometer Locations:	Please See Data Sheet No. 7
Cal. Procedure / Interval:	Calspan Procedure / 6 month
Integration Algorithm:	Trapezoidal
Linearity:	> 99%
Impact Velocity (km/h):	56.47
Velocity Change (km/h):	56.47
Time of Separation (ms):	100



CRUSH PROFILE

Collision Deformation Classification:	12FDEW2
Midpoint of Damage:	Vehicle Centerline
Damage Region Length (mm):	1424
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4448	4124	324
C2	Crush Zone 2 at Left Side	mm	4605	4147	458
C3	Crush Zone 3 at Left Side	mm	4623	4168	455
C4	Crush Zone 4 at Right Side	mm	4623	4171	452
C5	Crush Zone 5 at Right Side	mm	4604	4174	430
C6	Crush Zone 6 at Right Side	mm	4446	4089	357
L	C1 to C6	mm	1424	1497	-72

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

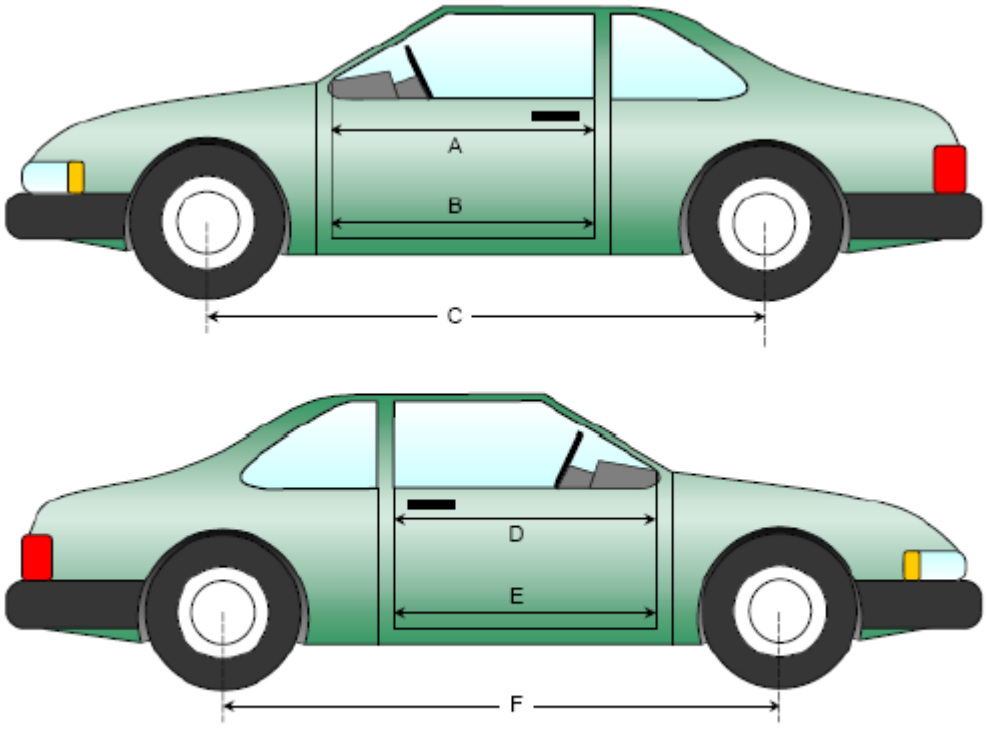
Test Vehicle: 2017 Subaru Impreza four door sedan
NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 2/22/2017

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1040	1039	-1
B	Left Side Lower	mm	867	866	-1
D	Right Side Upper	mm	1039	1039	0
E	Right Side Lower	mm	866	865	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2675	2662	-13
F	Right Side Wheelbase	mm	2675	2643	-32



Left & Right Side Views

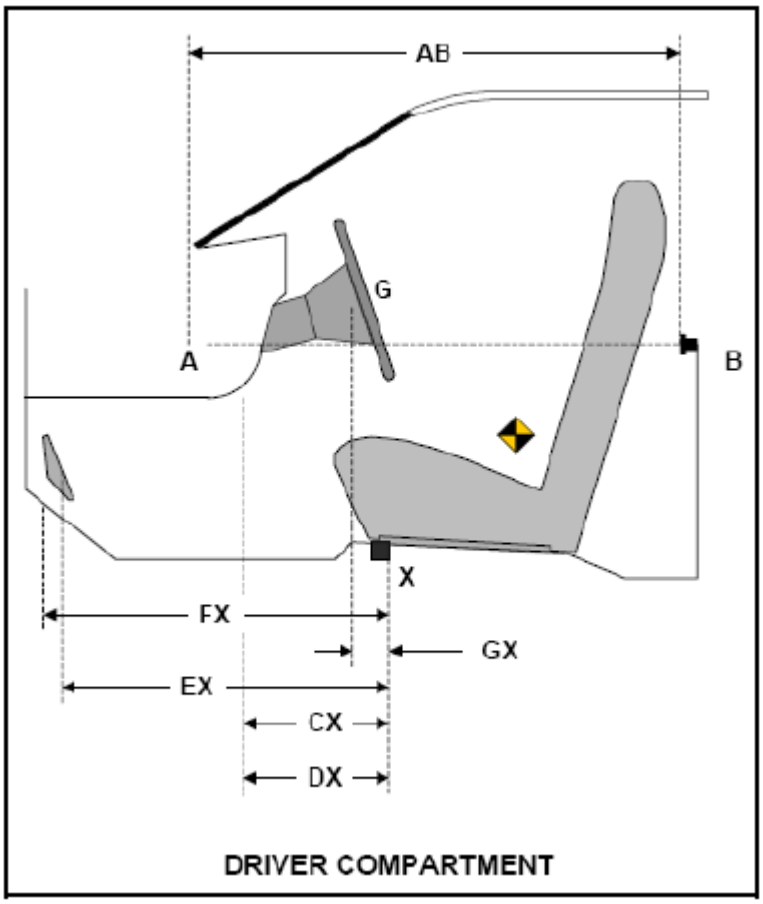
DATA SHEET NO.14 … (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2017 Subaru Impreza four door sedan NHTSA No.: O20175500
Test Program: NCAP Frontal Barrier Impact Test Test Date: 2/22/2017

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	965	964	-1
CX	Left Knee Bolster to X	mm	254	263	9
DX	Right Knee Bolster to X	mm	244	250	6
EX	Brake Pedal to X	mm	550	551	1
FX	Foot Rest to X	mm	615	584	-31
GX	Center of Steering Column Wheel Hub to X	mm	18	76	58

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017

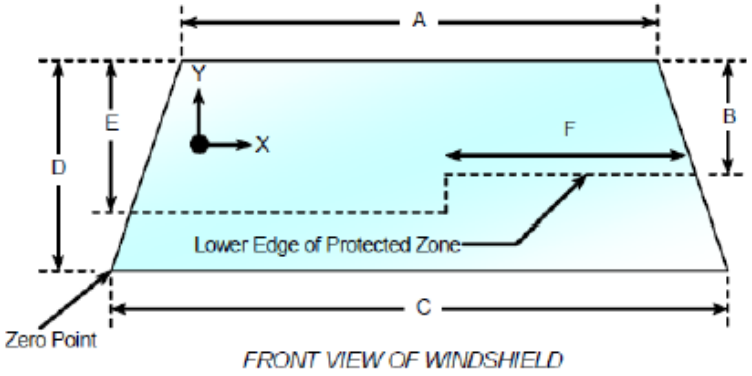
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21 ° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2222.5	2222.5	100
Right Side	2222.5	2222.5	100
Total	4445	4445	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1230
B	mm	566
C	mm	1475
D	mm	870
E	mm	595
F	mm	517

AREAS OF PROTECTED ZONE FAILURES

A. *Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.*
- No Penetration

X	Y

B. *Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.*
- No Penetration

X	Y

DATA SHEET NO. 15 … (CONTINUED)
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C Test Time: 11:25 AM

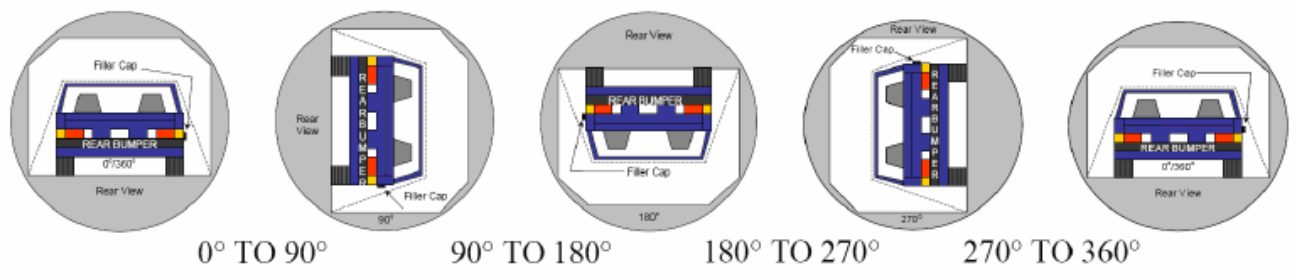
STODDARD SOLVENT SPILLAGE MEASUREMENTS

A. From impact until vehicle motion ceases: (Maximum allowable is 1 oz.)	0	oz.
B. For the 5-minute period after motion ceases: (Maximum allowable is 5 oz.)	0	oz.
C. For the following 25 minutes: (Maximum allowable is 1 oz./minute)	0	oz.

D. Spillage: No Spillage Occurred

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017



1. The specified fixture rollover rate for each 90°of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage: No Spillage Occurred

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	72	300	372
90° to 180°	63	300	363
180° to 270°	60	300	360
270° to 360°	70	300	370

FMVSS 301 SPILLAGE TABLE

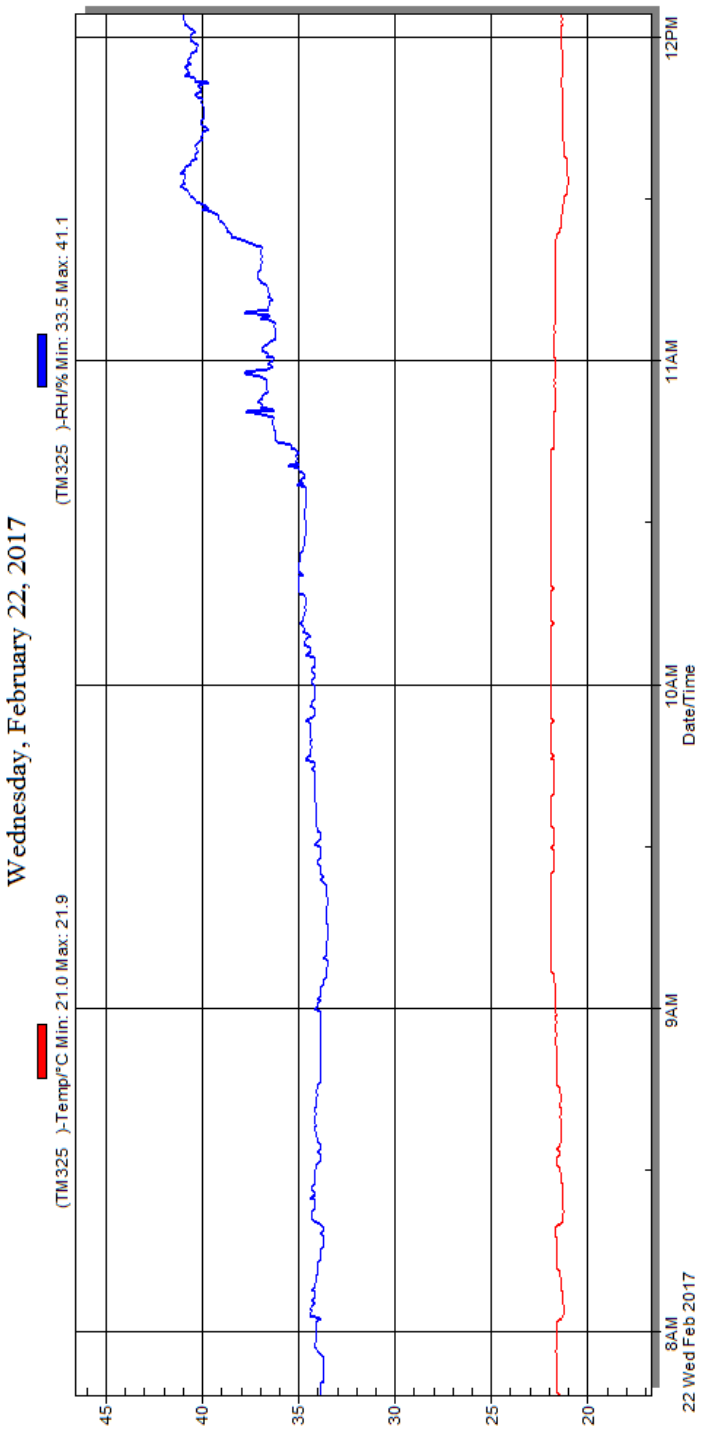
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2017 Subaru Impreza four door sedan	NHTSA No.:	O20175500
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	2/22/2017



Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

[1]**NOTE**: *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*

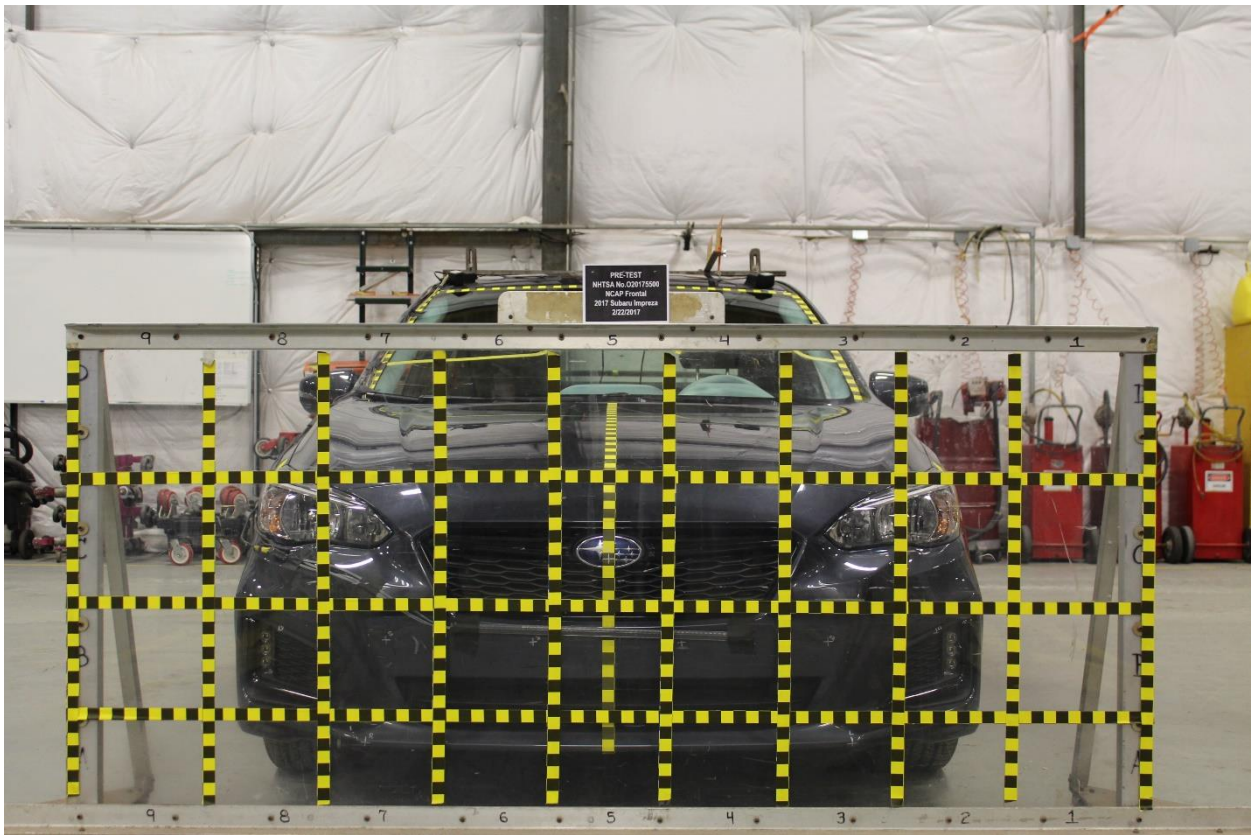


Figure A-1: Load Cell Location

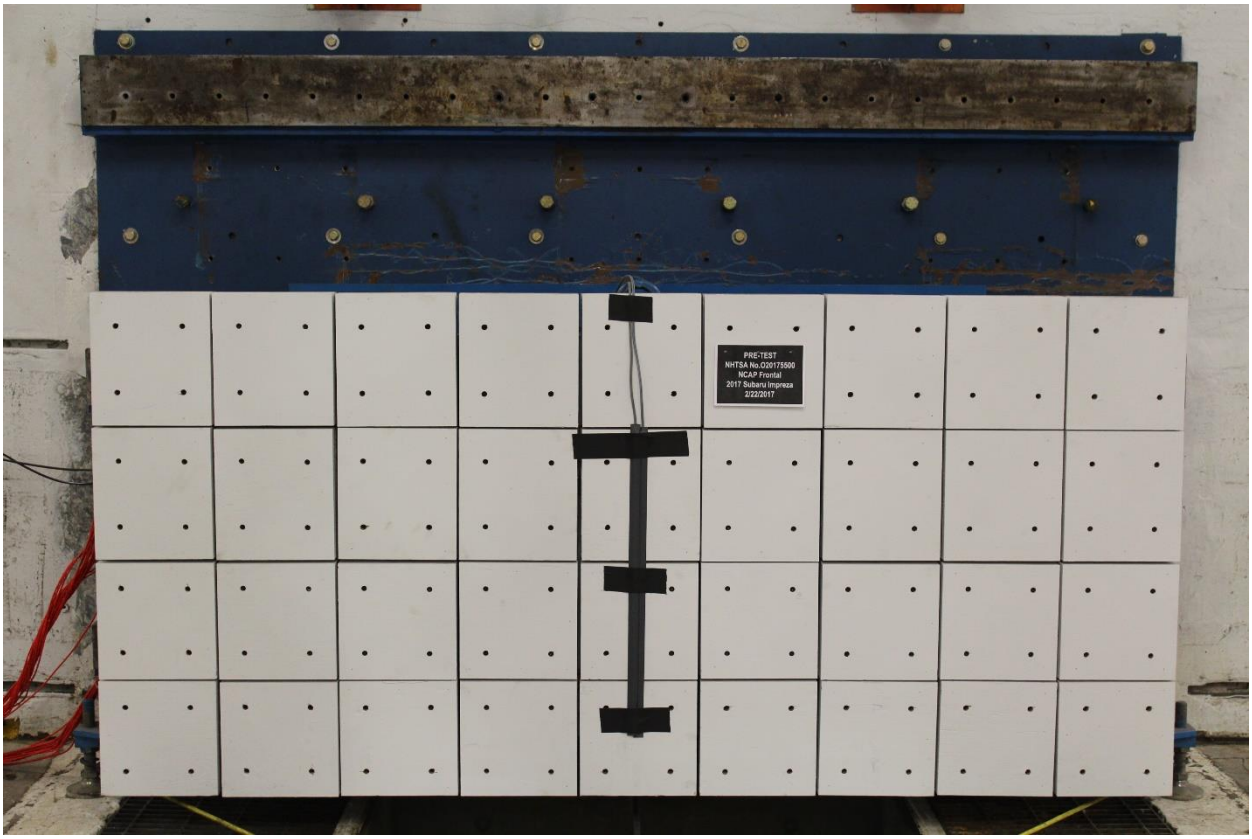


Figure A-2: Pre-Test Load Cell Wall

Figure A-3: Post-Test Load Cell Wall

Figure A-4: Manufacturer's Label

Figure A-5: Tire Placard

Figure A-6: 2017 Subaru Impreza Frontal As Delivered

Figure A-7: Left Rear 3-4 View, As Received

Figure A-8: Pre-Test Front View of Test Vehicle

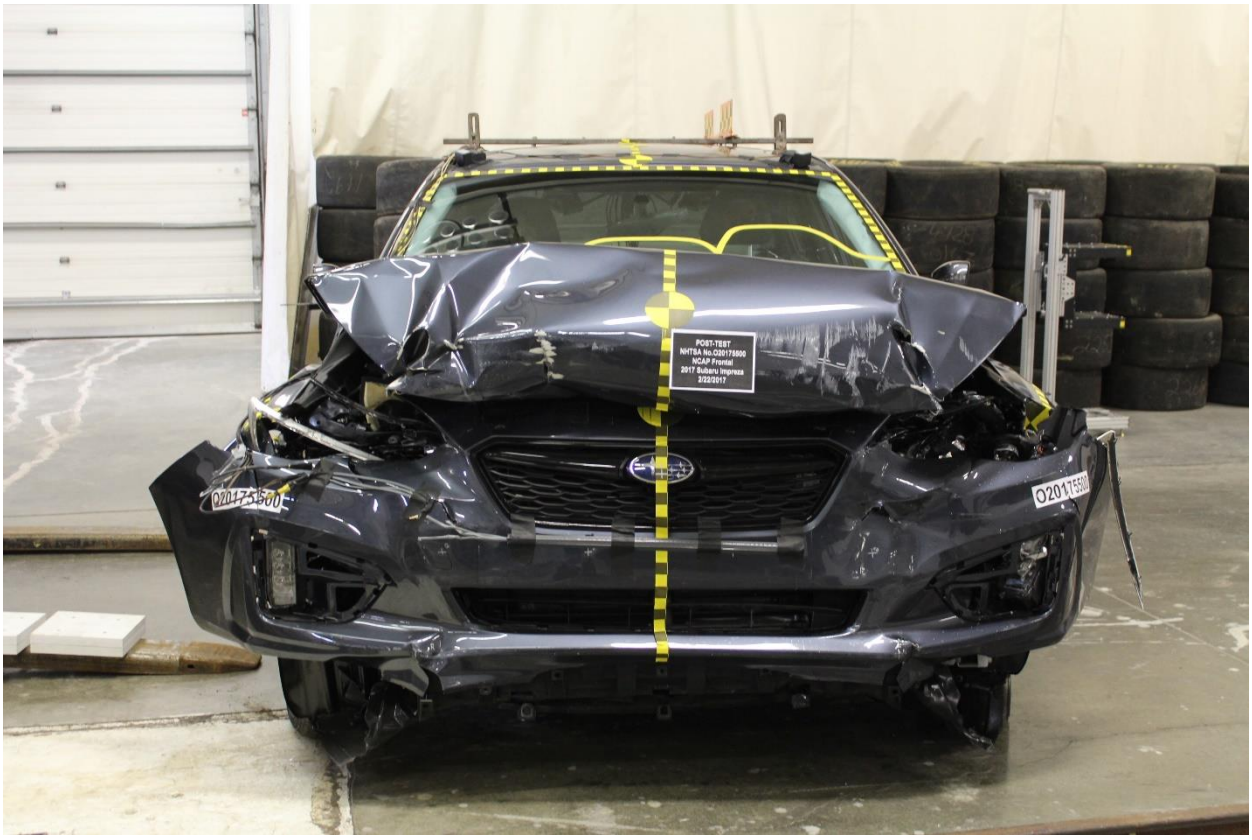


Figure A-9: Post-Test Front View of Test Vehicle

Figure A-10: Pre-Test Left View of Test Vehicle

Figure A-11: Post-Test Left View of Test Vehicle

Figure A-12: Pre-Test Right View of Test Vehicle

Figure A-13: Post-Test Right View of Test Vehicle

Figure A-14: Pre-Test Right Front 3-4 View

Figure A-15: Post-Test Right Front 3-4 View

Figure A-16: Pre-Test Left Rear 3-4 View

Figure A-17: Post-Test Left Rear 3-4 View

Figure A-18: Pre-Test Windshield View

Figure A-19: Post-Test Windshield View

Figure A-20: Pre-Test Engine Compartment View

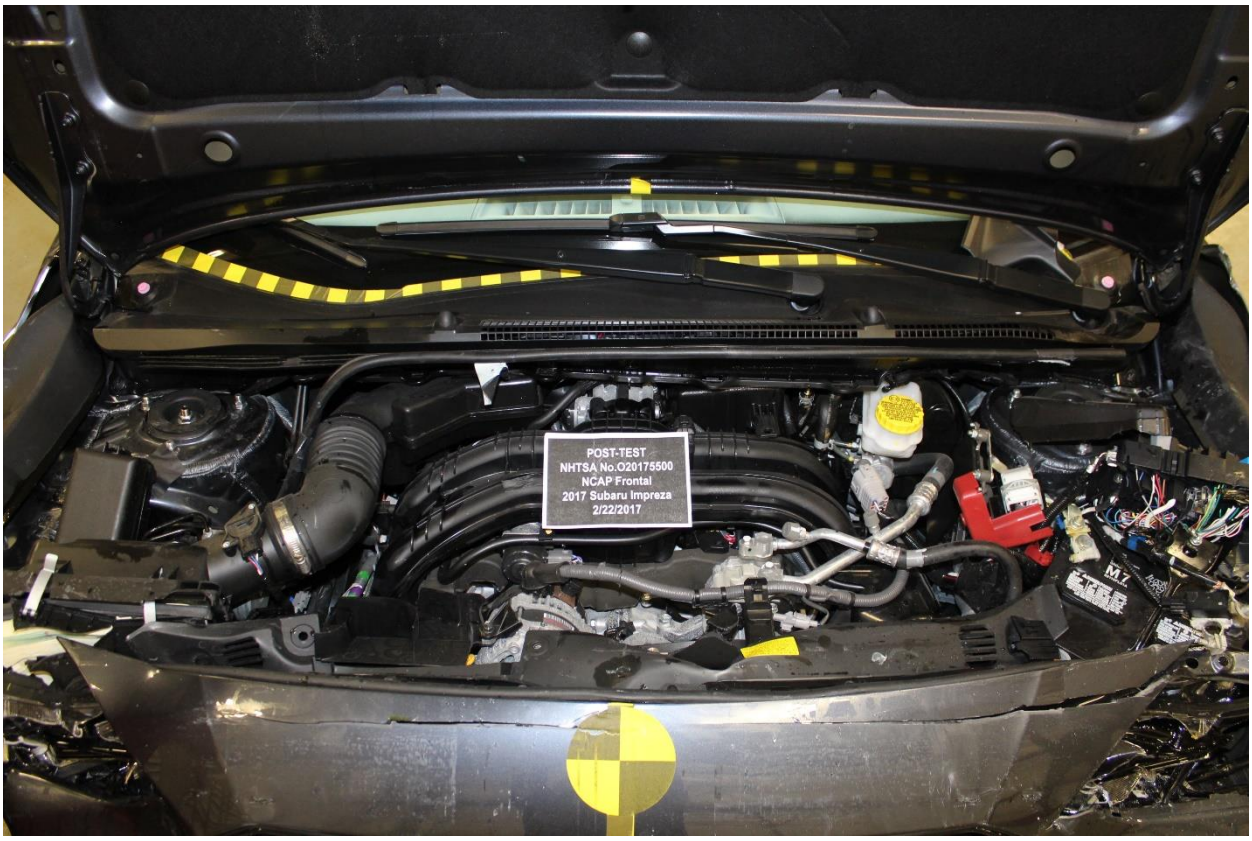


Figure A-21: Post-Test Engine Compartment View

Figure A-22: Pre-Test Fuel Filler Cap View

Figure A-23: Post-Test Fuel Filler Cap View

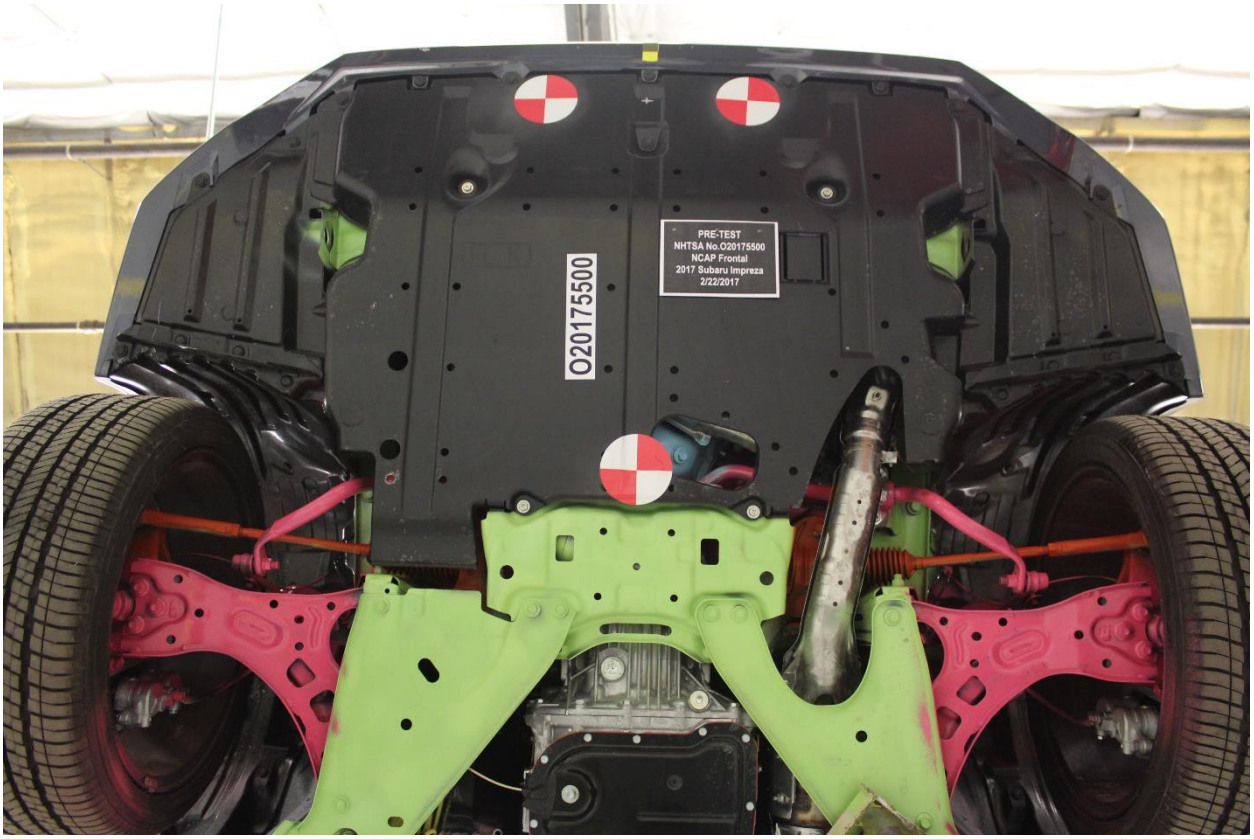


Figure A-24: Pre-Test Front Underbody View

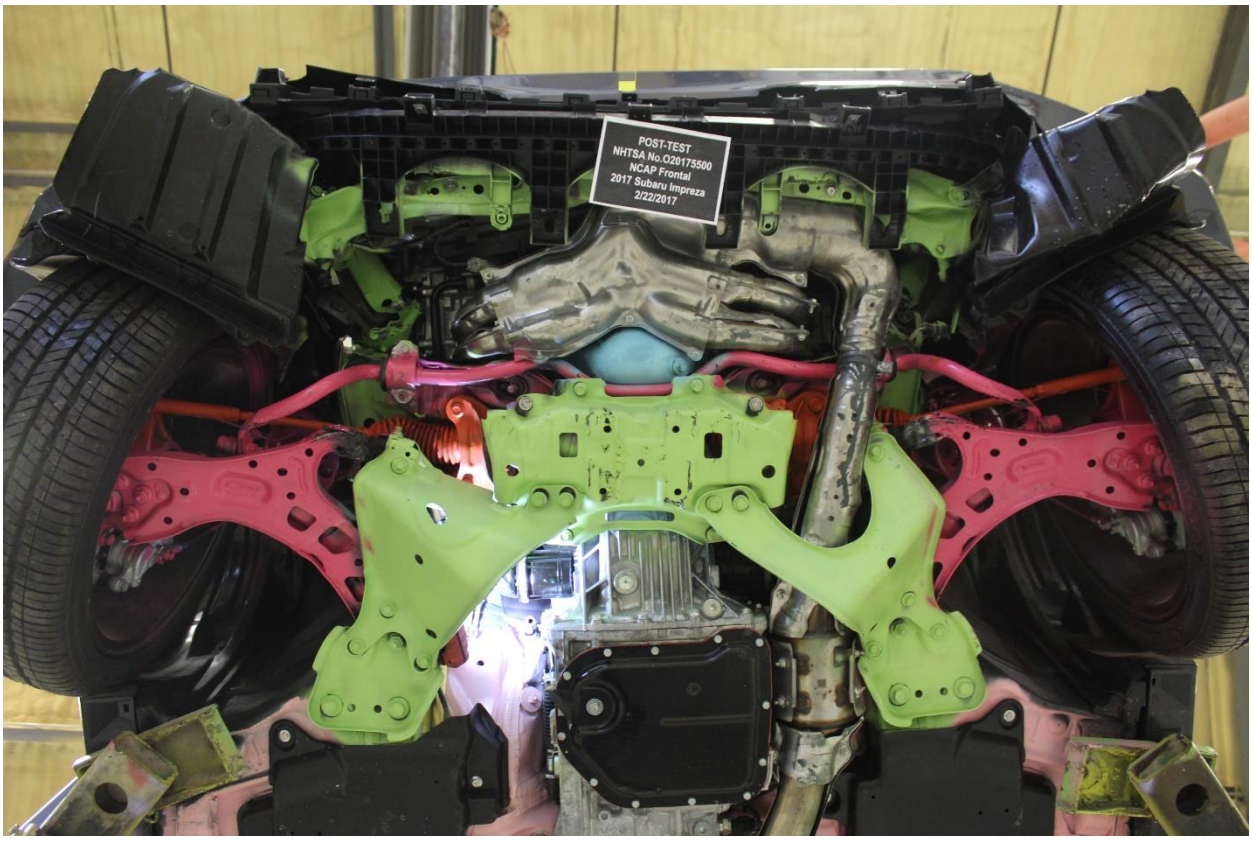


Figure A-25: Post-Test Front Underbody View

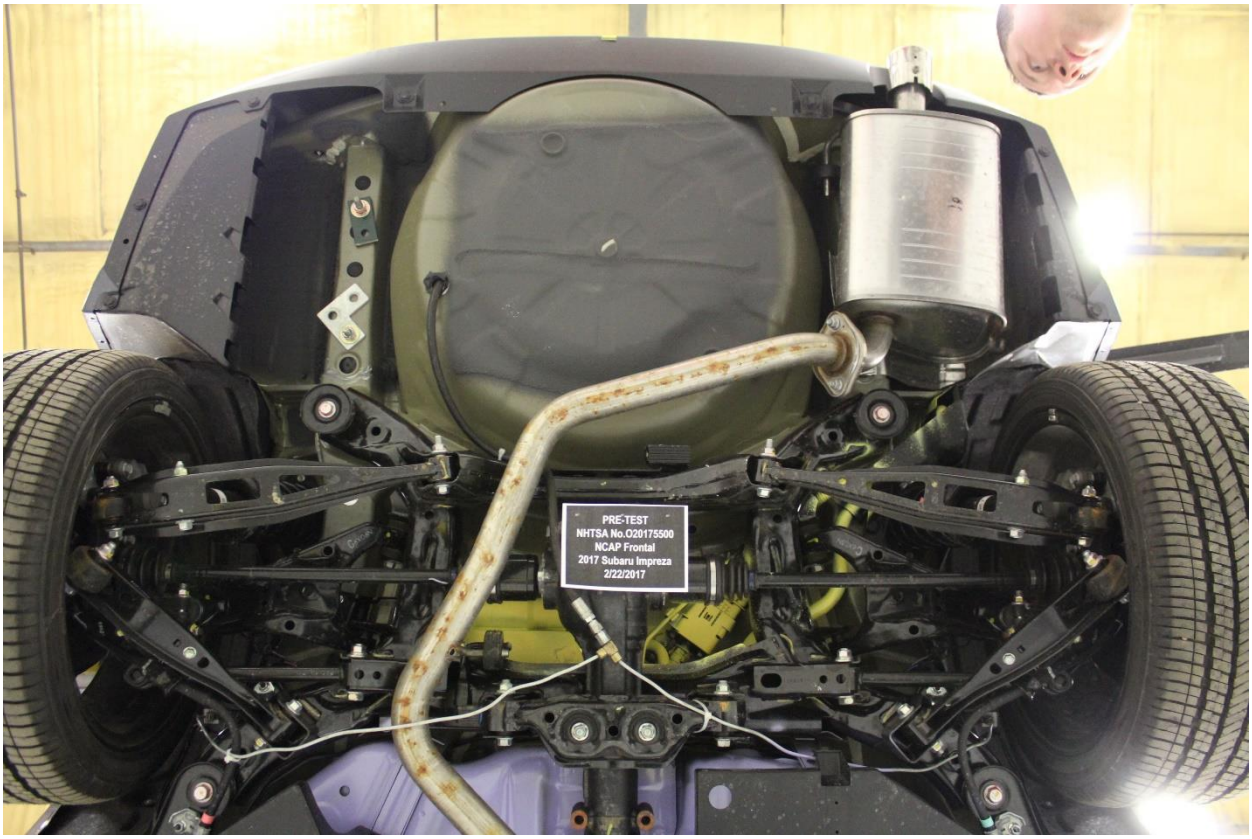


Figure A-26: Pre-Test Rear Underbody View

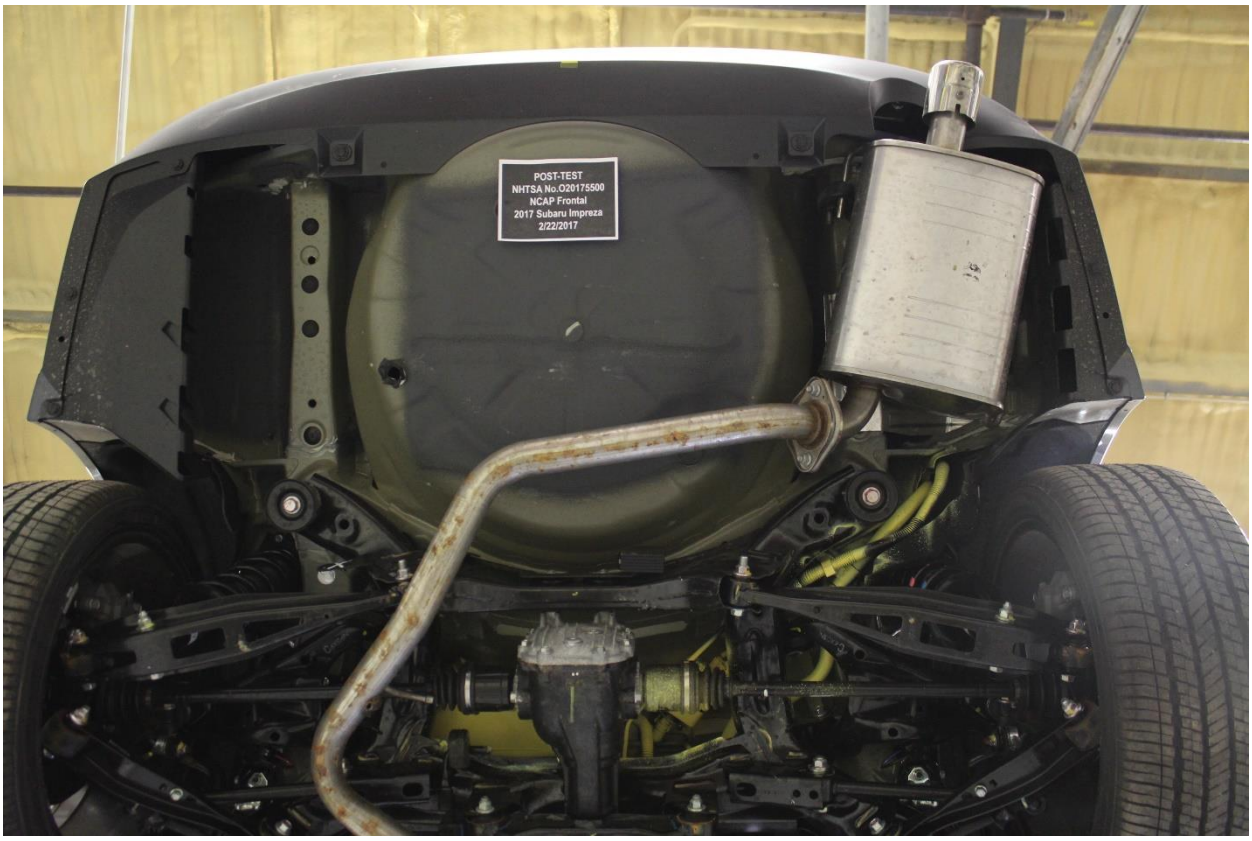


Figure A-27: Post-Test Rear Underbody View

Figure A-28: Pre-Test Dummy Cable Routing

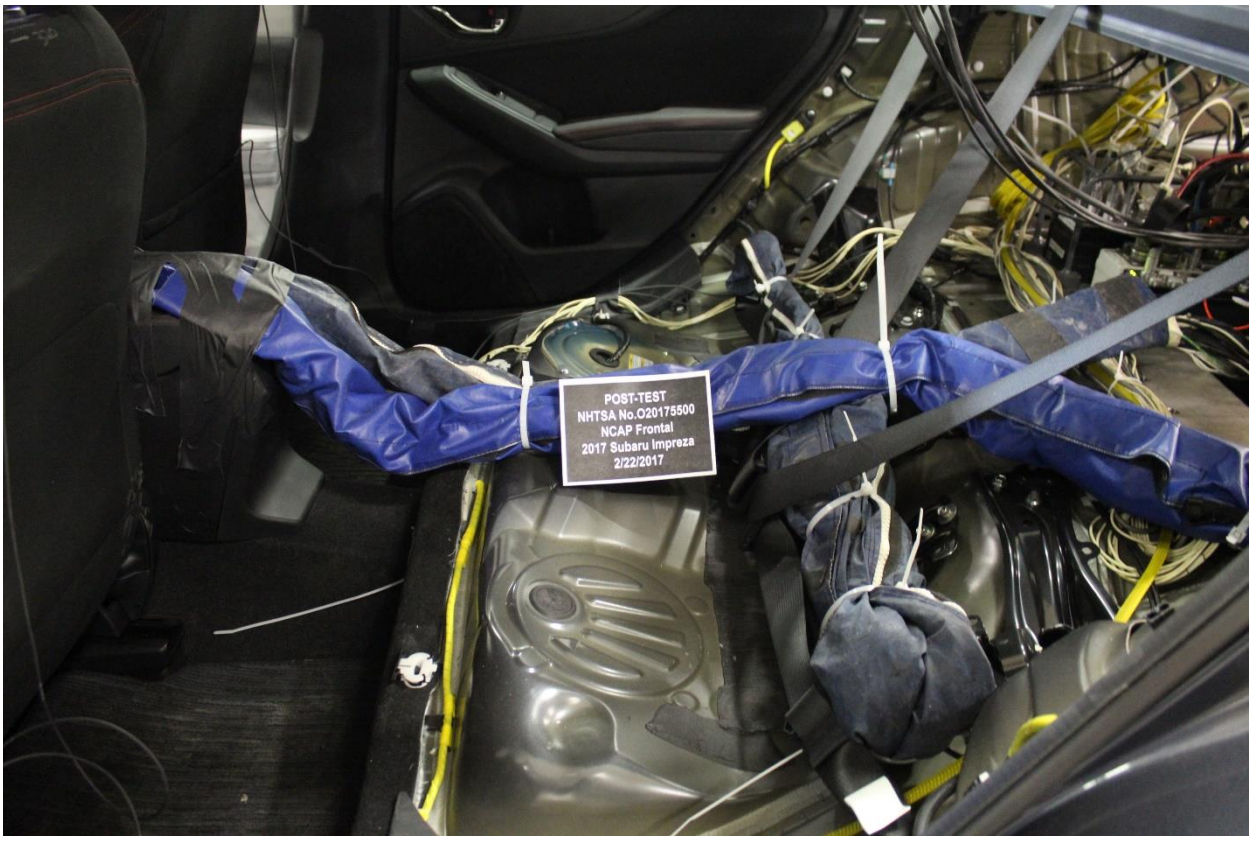


Figure A-29: Post-Test Dummy Cable Routing

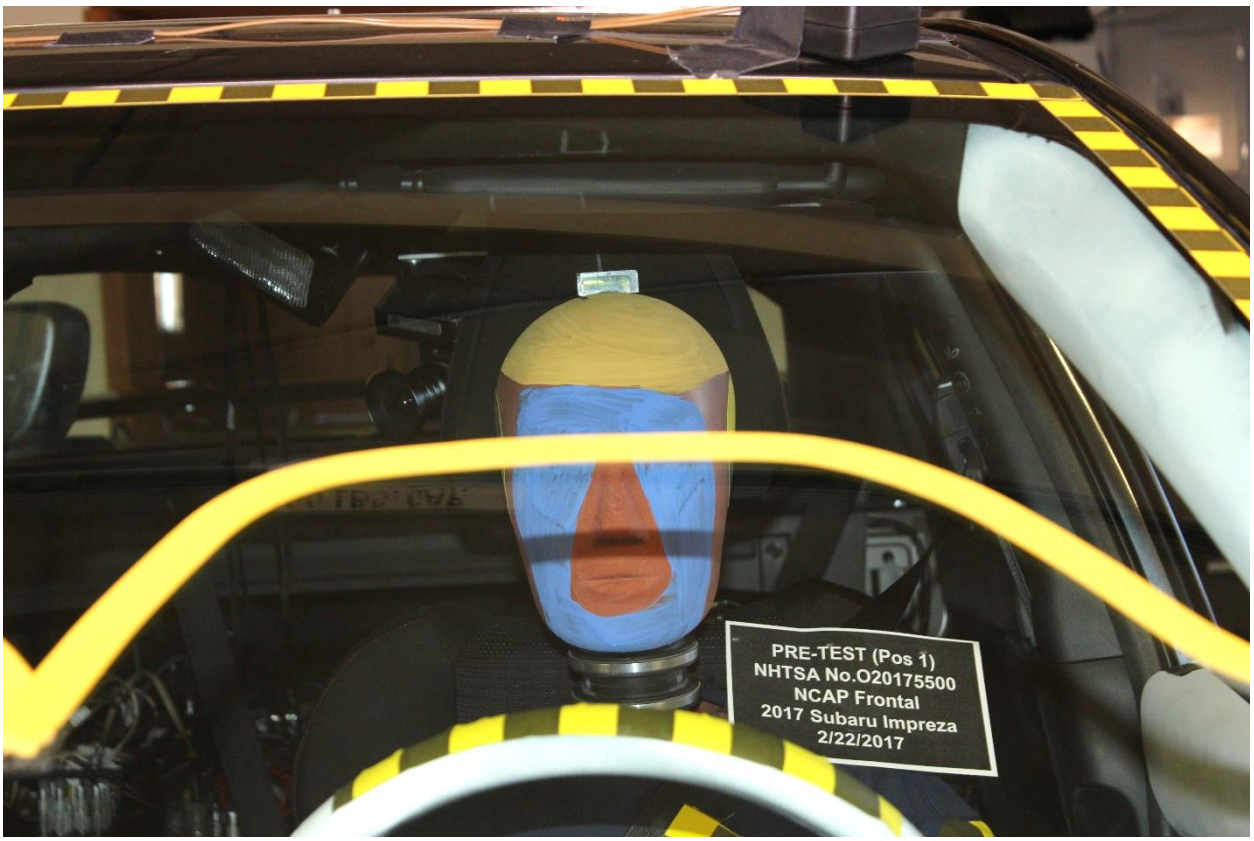


Figure A-30: Pre-Test Driver Dummy Front View

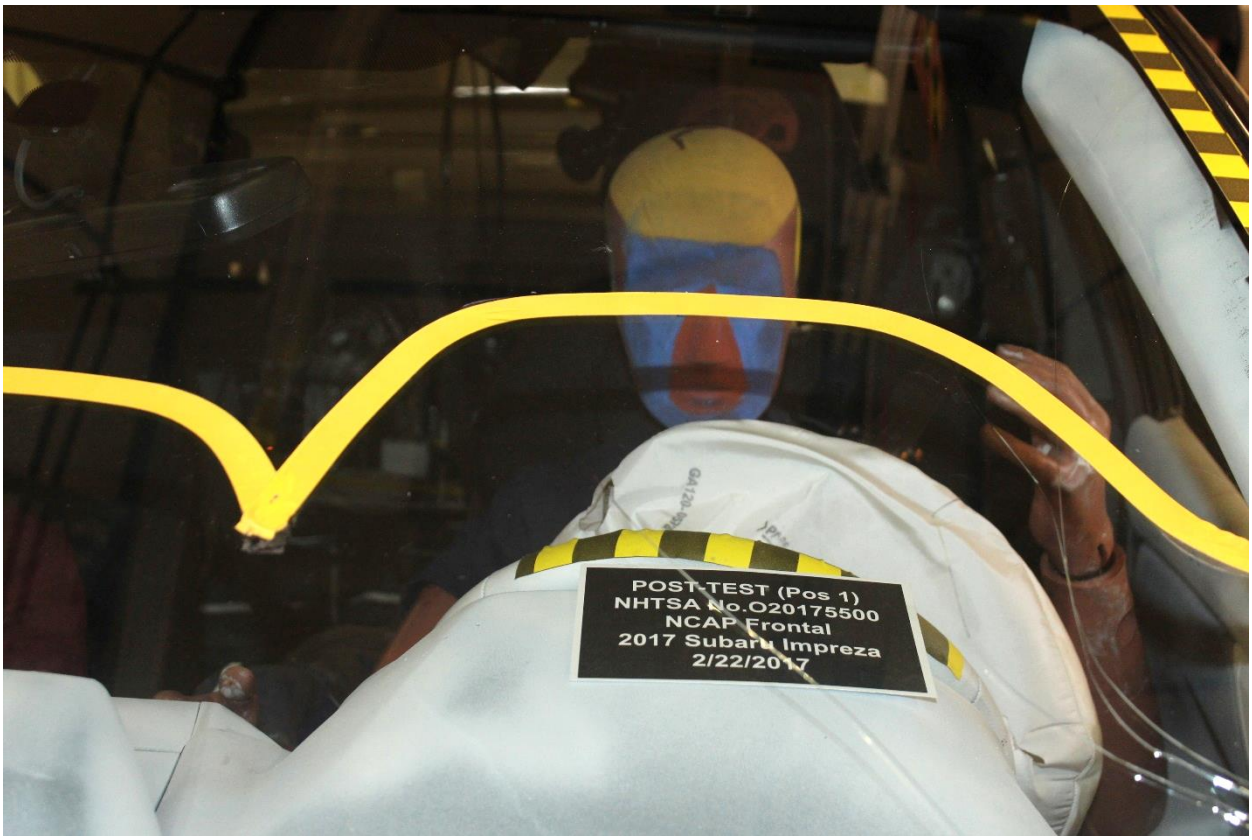


Figure A-31: Post-Test Driver Dummy Front View

Figure A-32: Pre-Test Driver Dummy Window View

Figure A-33: Post-Test Driver Dummy Window View

Figure A-34: Pre-Test Driver Dummy and Vehicle Interior View

Figure A-35: Post-Test Driver Dummy and Vehicle Interior View

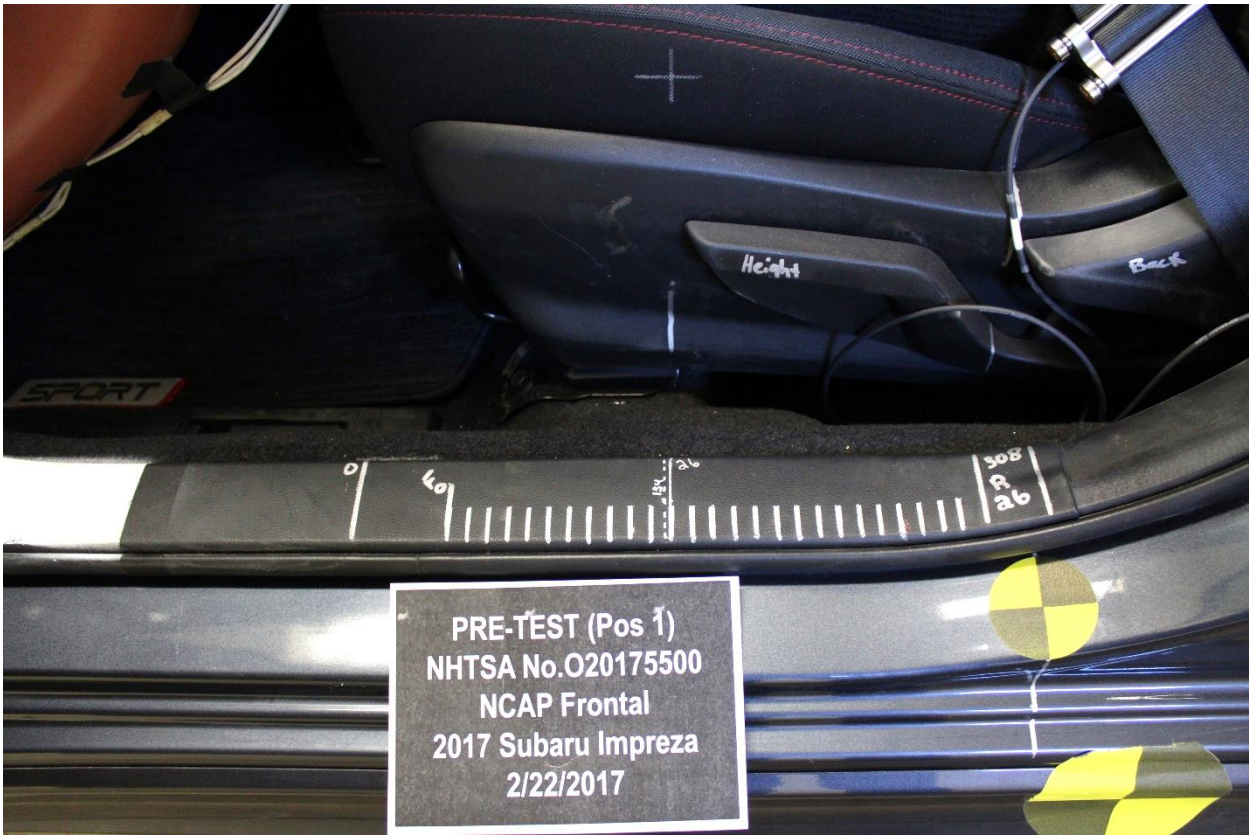


Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings

Figure A-37: Post-Test Driver's Seat Fore-Aft Markings

Figure A-38: Pre-Test View of Belt Anchorage for Driver Dummy

Figure A-39: Post-Test View of Belt Anchorage for Driver Dummy

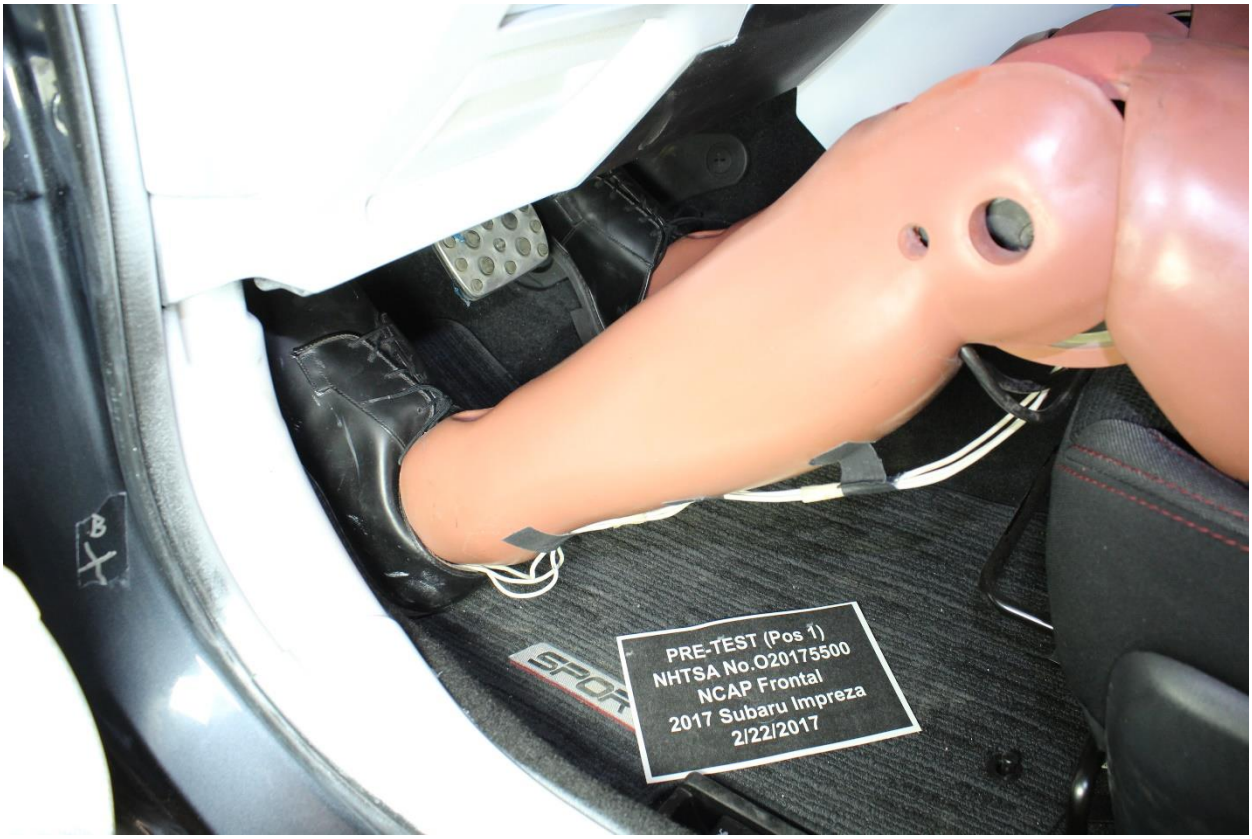


Figure A-40: Pre-Test Driver Dummy Feet

Figure A-41: Post-Test Driver Dummy Feet

Figure A-42: Pre-Test Driver's Side Knee Bolster

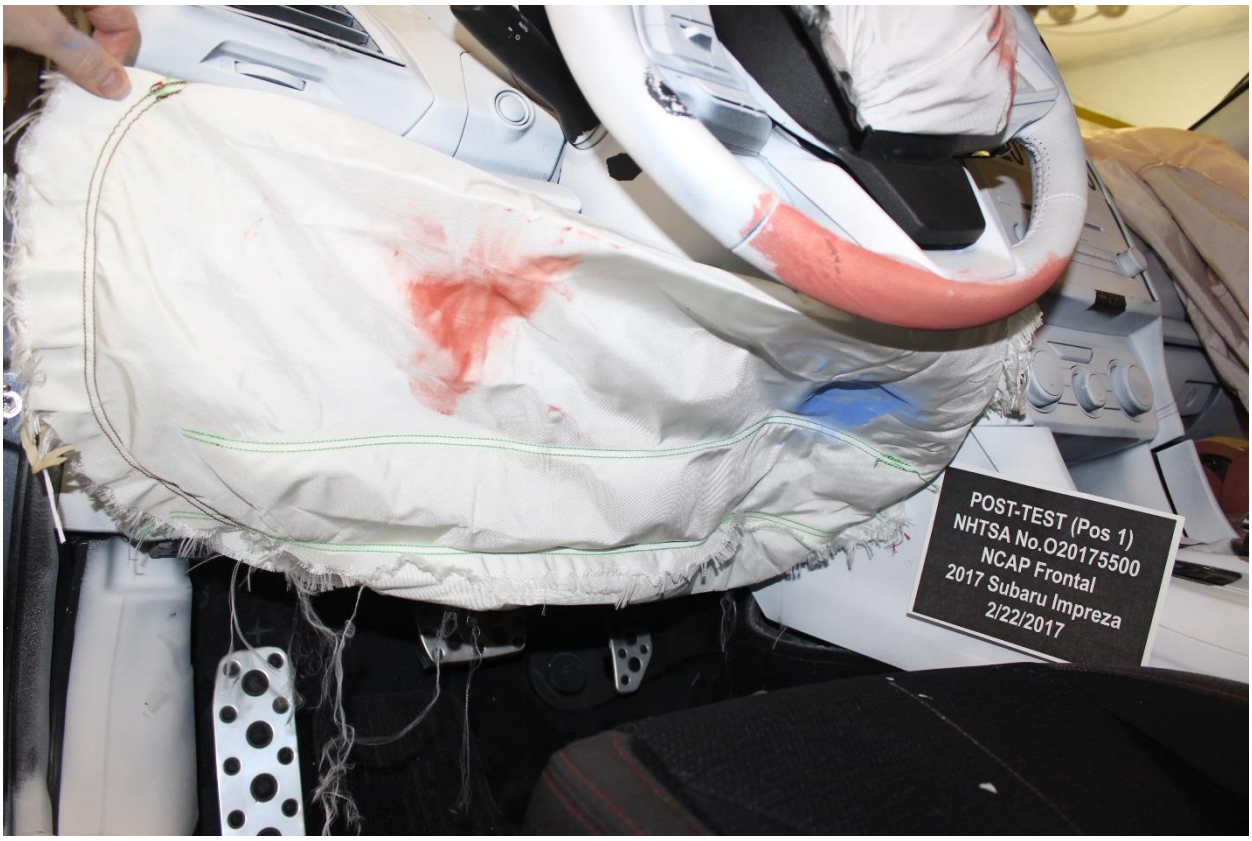


Figure A-43: Post-Test Driver's Side Knee Bolster

Figure A-44: Pre-Test Driver's Side Floorpan

Figure A-45: Post-Test Driver's Side Floorpan

Figure A-46: Post-Test Driver Dummy Face

Figure A-47: Post-Test Driver Dummy Contact With Airbag

Figure A-48: Post-Test Driver Dummy Contact With Headrest

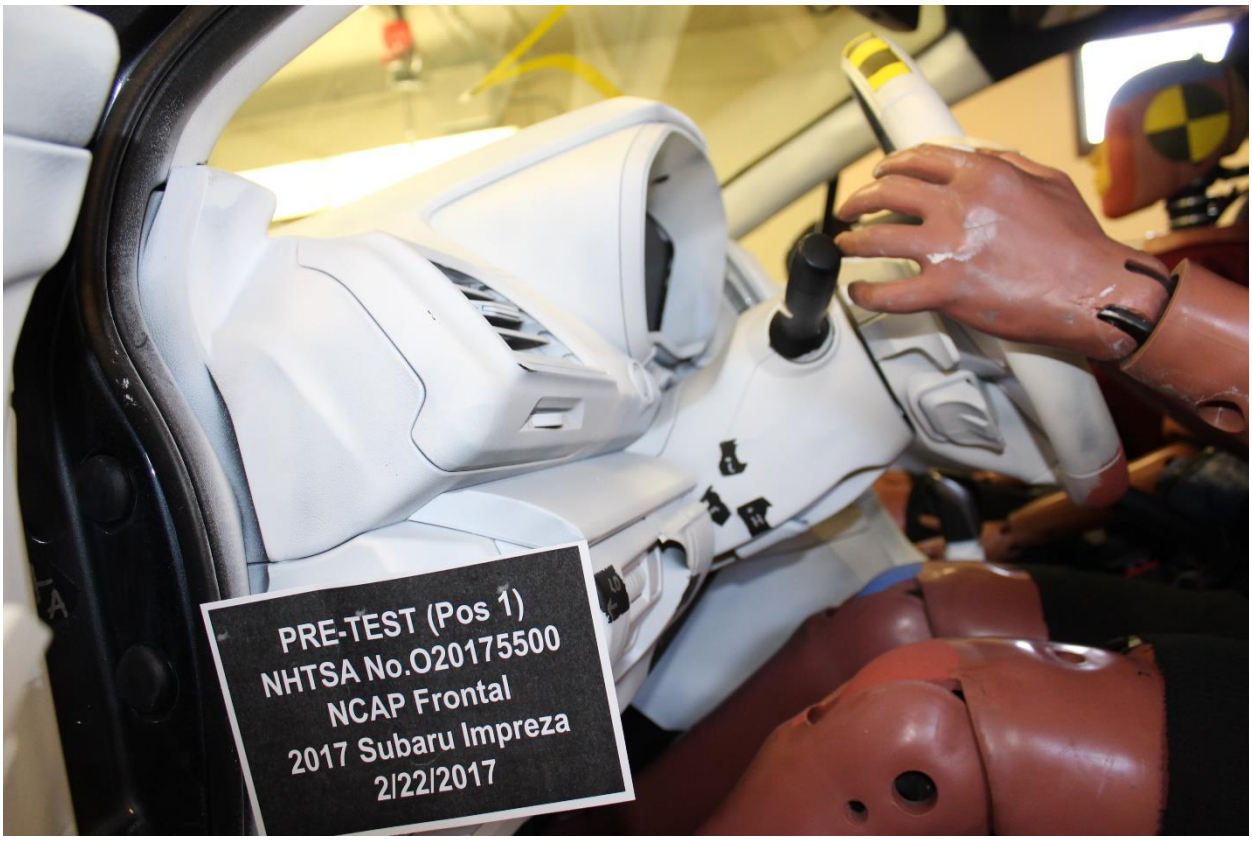


Figure A-49: Pre-Test View of the Steering Wheel

Figure A-50: Post-Test View of the Steering Wheel

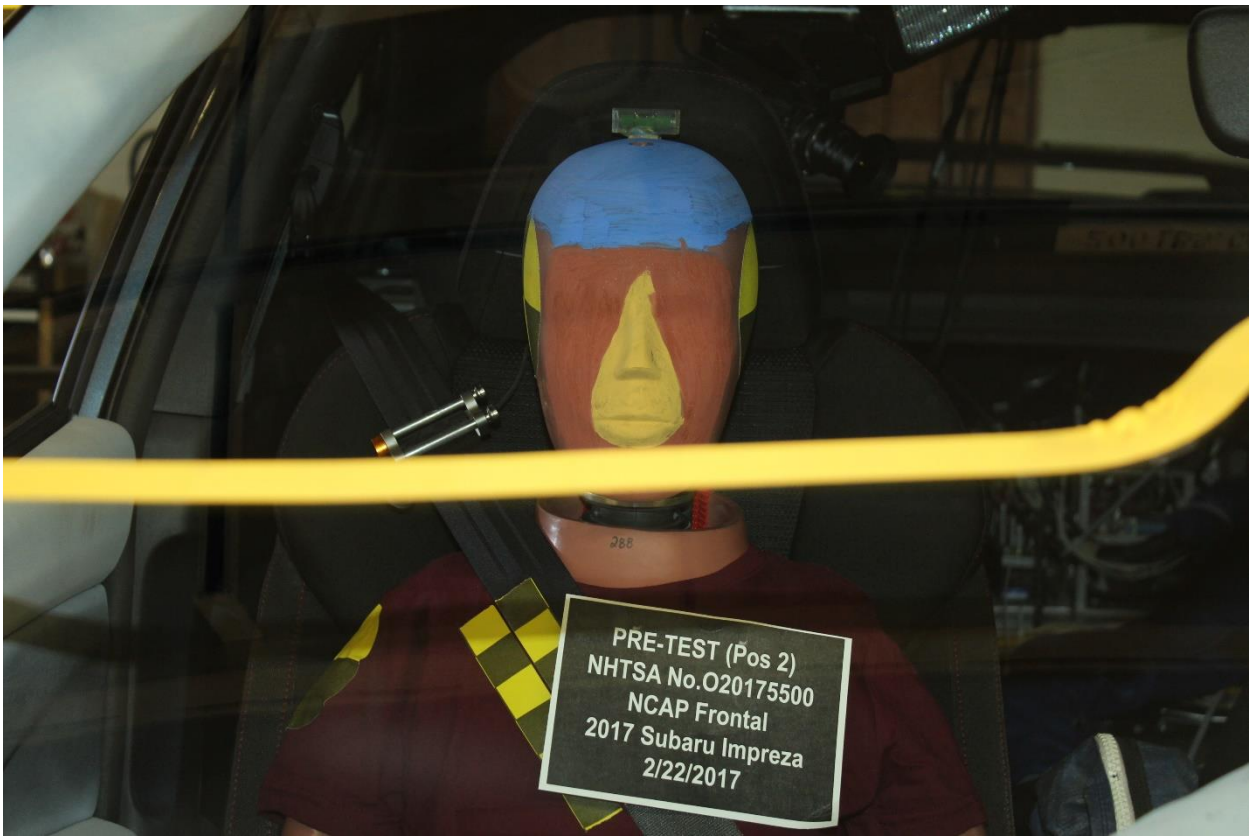


Figure A-51: Pre-Test Passenger Dummy Front View

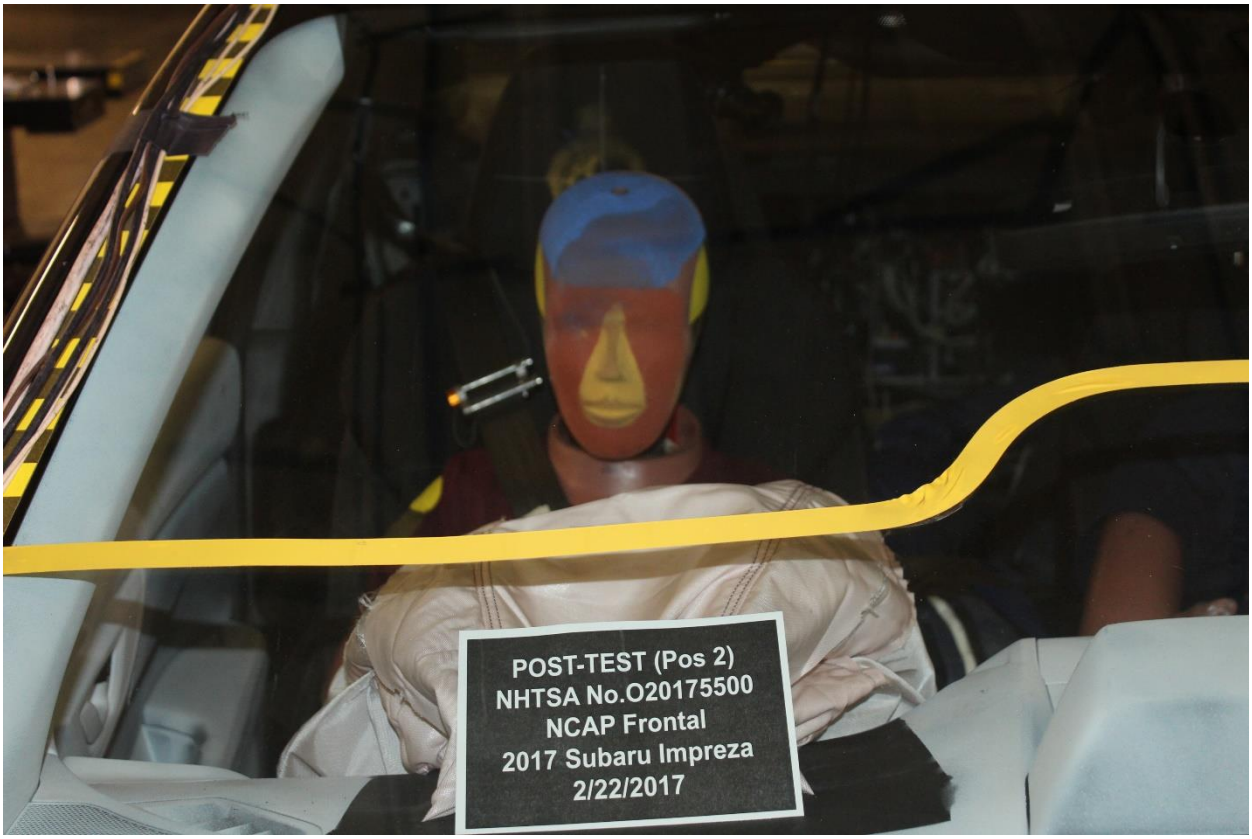


Figure A-52: Post-Test Passenger Dummy Front View

Figure A-53: Pre-Test Passenger Dummy Window View

Figure A-54: Post-Test Passenger Dummy Window View

Figure A-55: Pre-Test Passenger Dummy and Vehicle Interior View

Figure A-56: Post-Test Passenger Dummy and Vehicle Interior View

Figure A-57: Pre-Test Passenger's Seat Fore-Aft Markings

Figure A-58: Post-Test Passenger's Seat Fore-Aft Markings

Figure A-59: Pre-Test View of Belt Anchorage for Passenger Dummy

Figure A-60: Post-Test View of Belt Anchorage for Passenger Dummy

Figure A-61: Pre-Test Passenger Dummy Feet

Figure A-62: Post-Test Passenger Dummy Feet

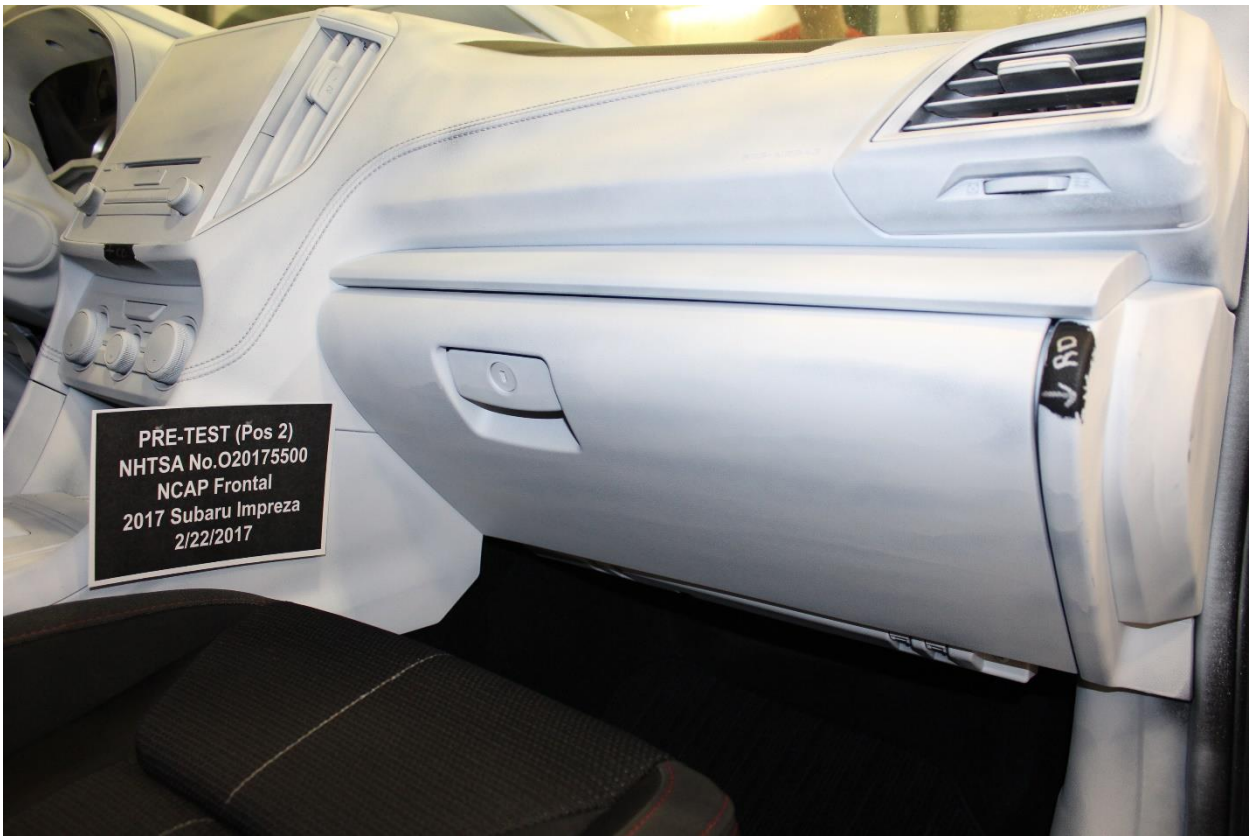


Figure A-63: Pre-Test Passenger's Side Knee Bolster

Figure A-64: Post-Test Passenger's Side Knee Bolster

Figure A-65: Pre-Test Passenger's Side Floorpan

Figure A-66: Post-Test Passenger's Side Floorpan

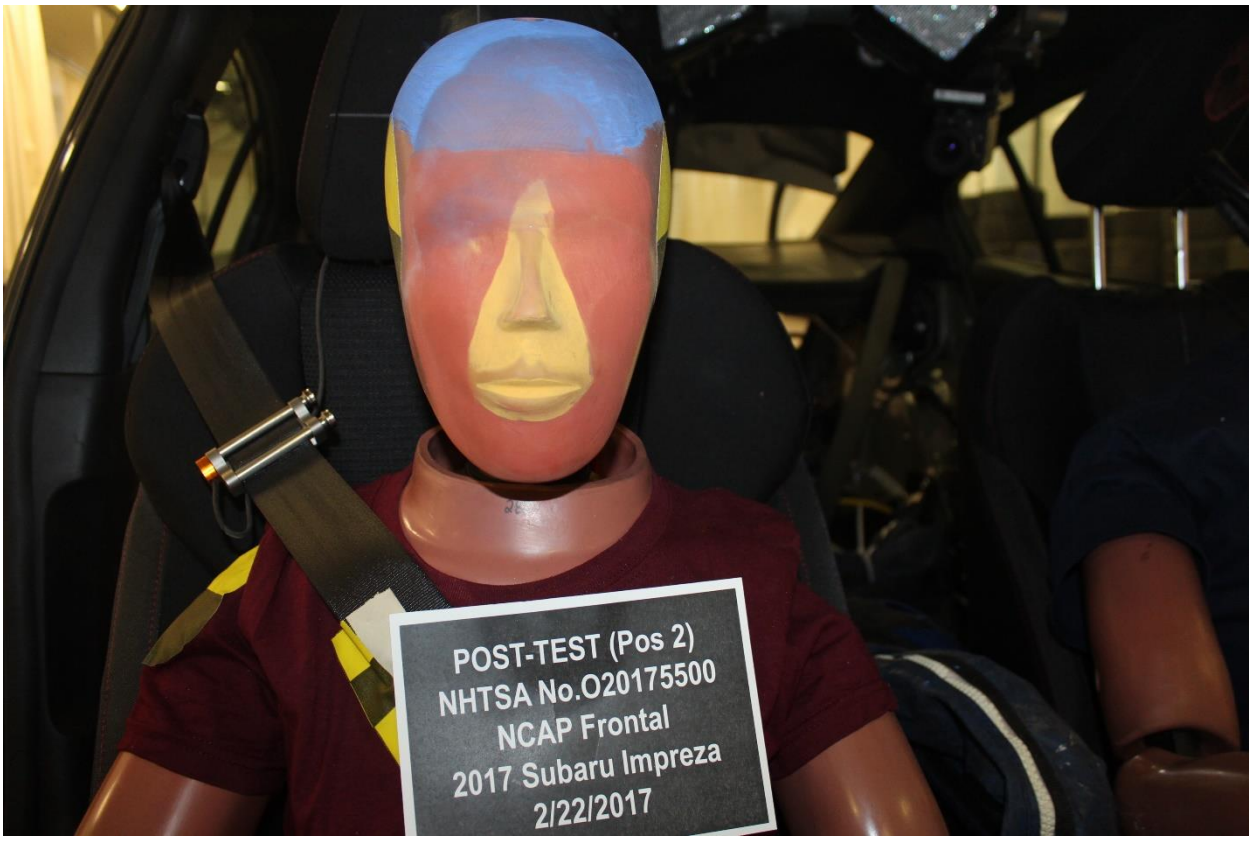


Figure A-67: Post-Test Passenger Dummy Face

Figure A-68: Post-Test Passenger Dummy Contact With Airbag

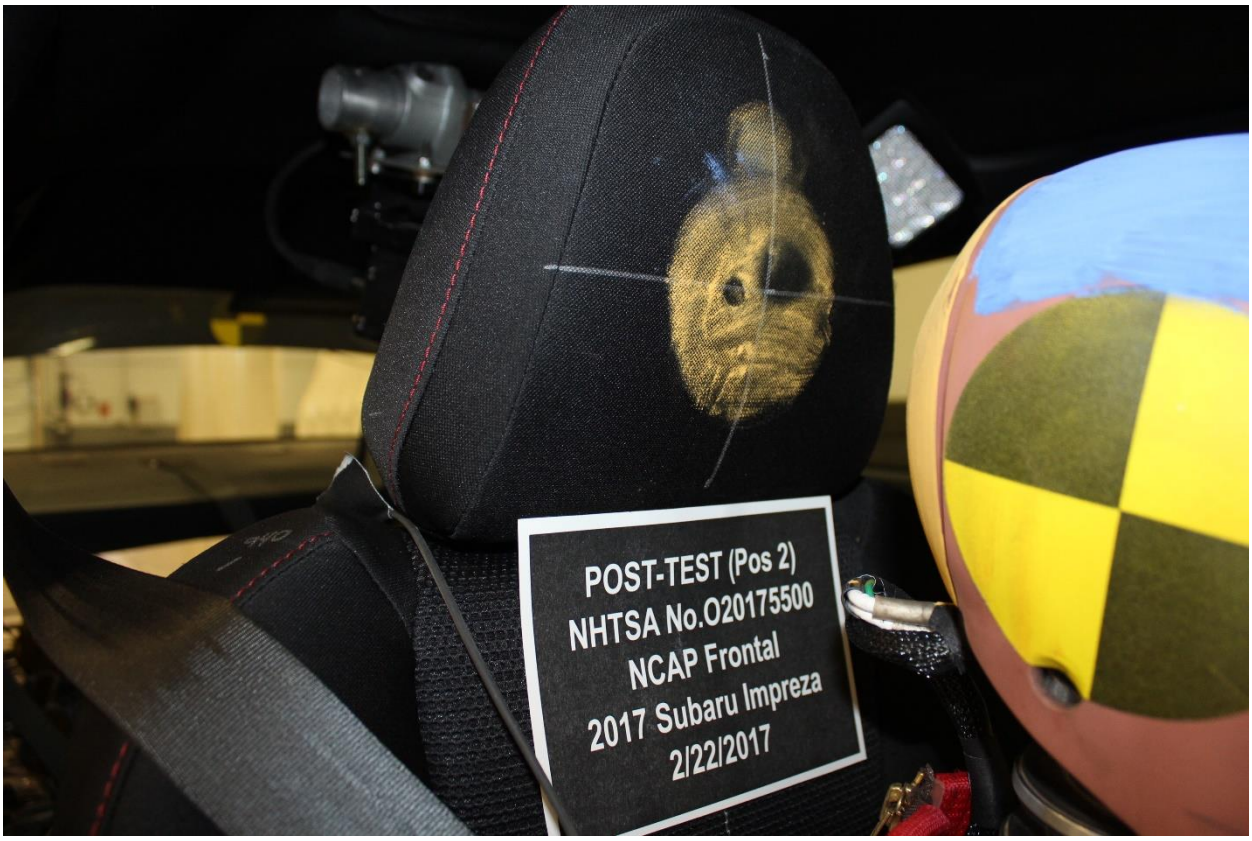


Figure A-69: Post-Test Passenger Dummy Contact With Headrest

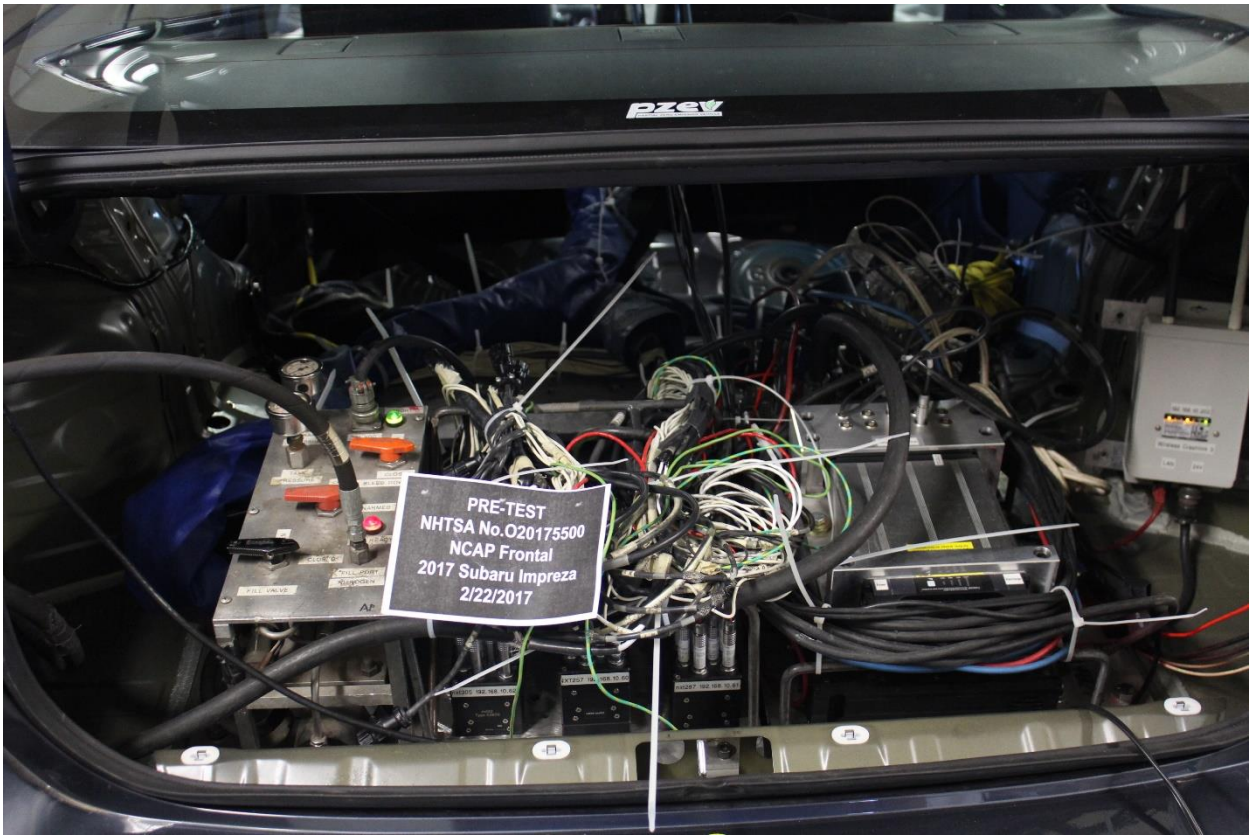


Figure A-70: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

Figure A-71: Post-Test Stoddard Solvent Spillage Location View, If Required

Figure A-72: Post-Test Speed Trap Read-Out

Figure A-73: Vehicle at 0º on Static Rollover Device

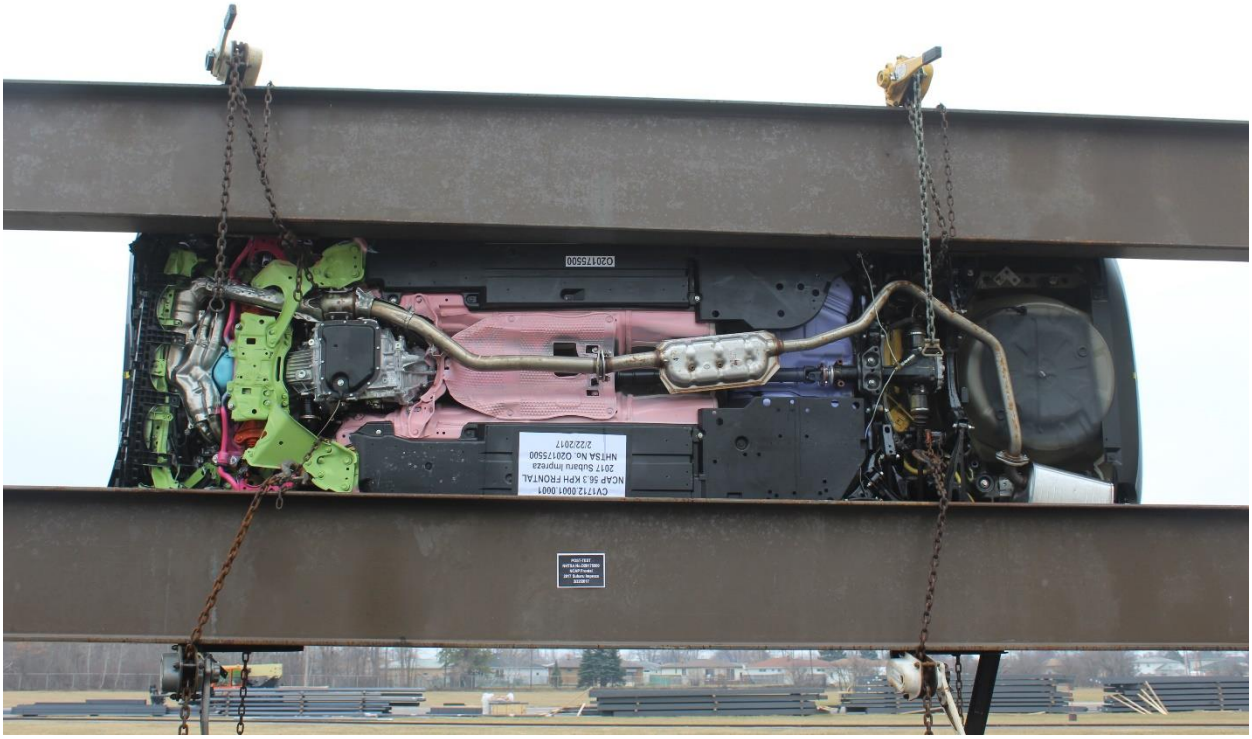


Figure A-74: Vehicle at 90º on Static Rollover Device

Figure A-75: Vehicle at 180º on Static Rollover Device

Figure A-76: Vehicle at 270º on Static Rollover Device

Figure A-77: Vehicle at 360º on Static Rollover Device

Figure A-78: 2017 Subaru Impreza Frontal Impact Event

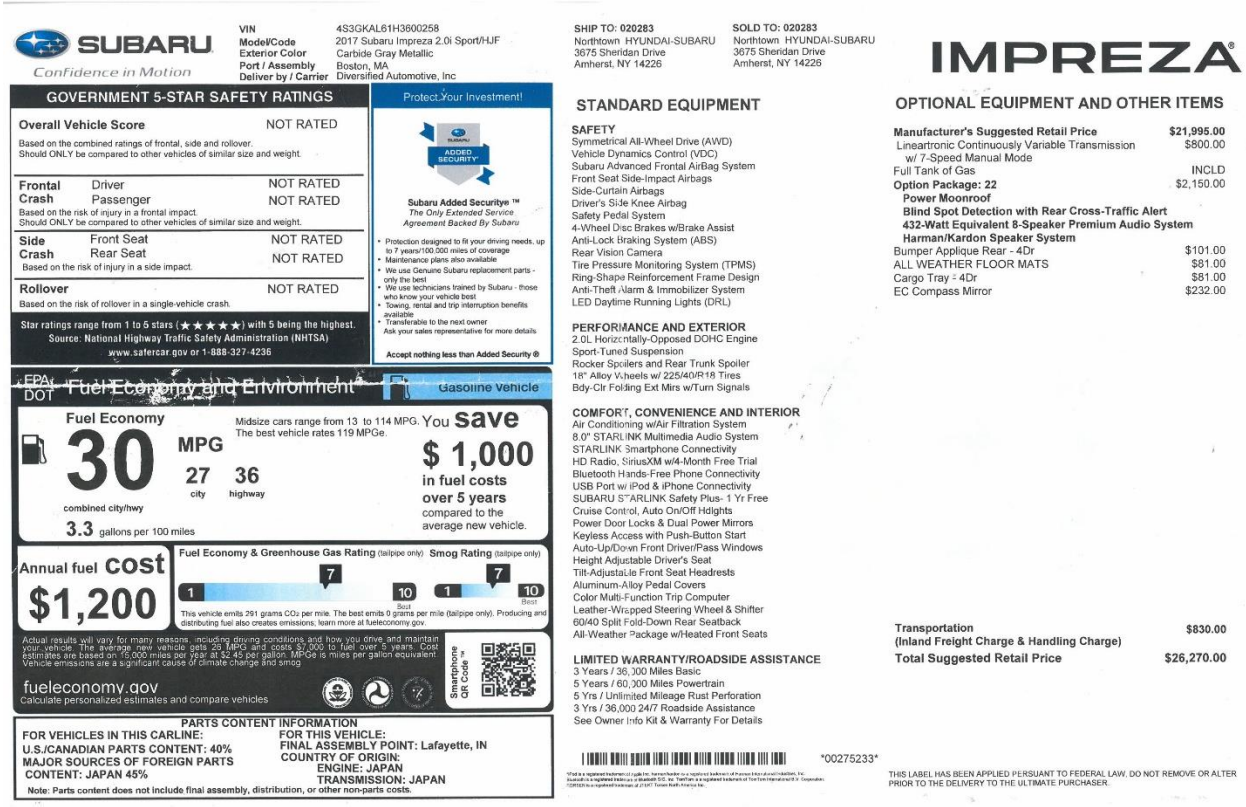
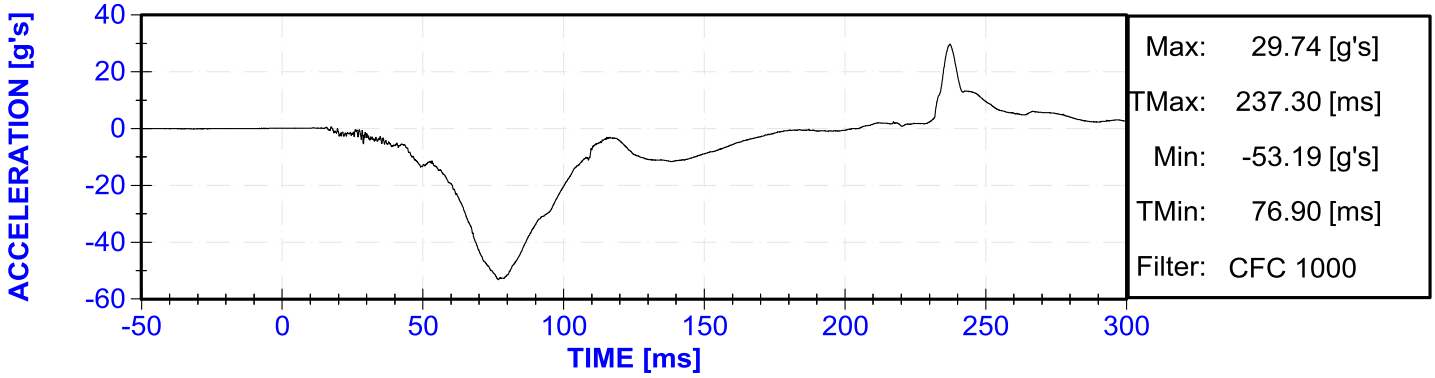


Figure A-79: Monroney Label Photograph

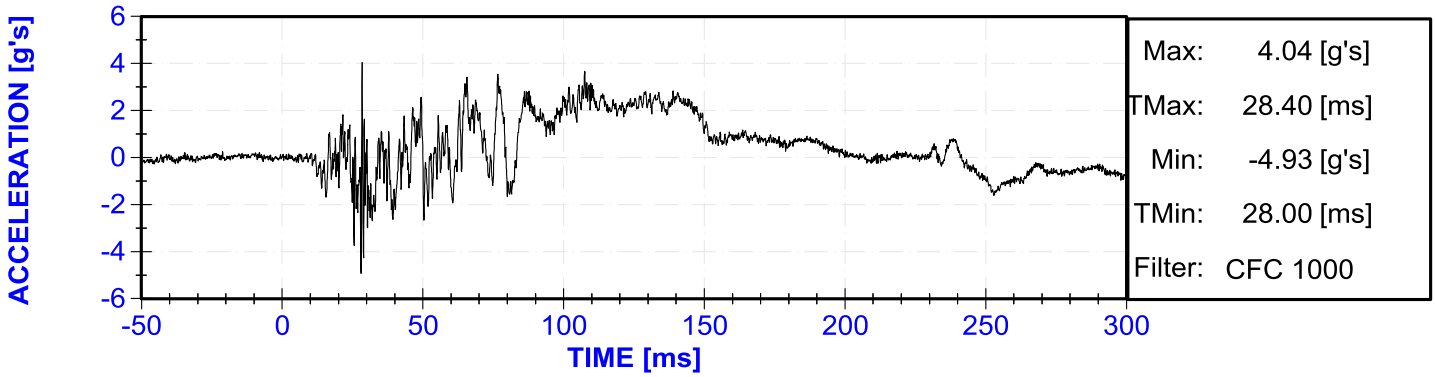
APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots

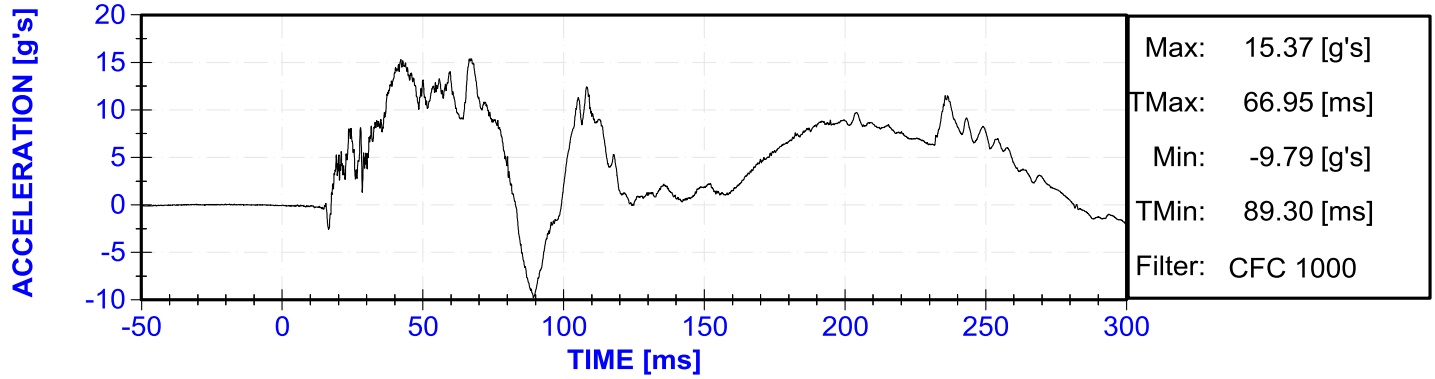
Driver Head X Acceleration vs. Time Primary



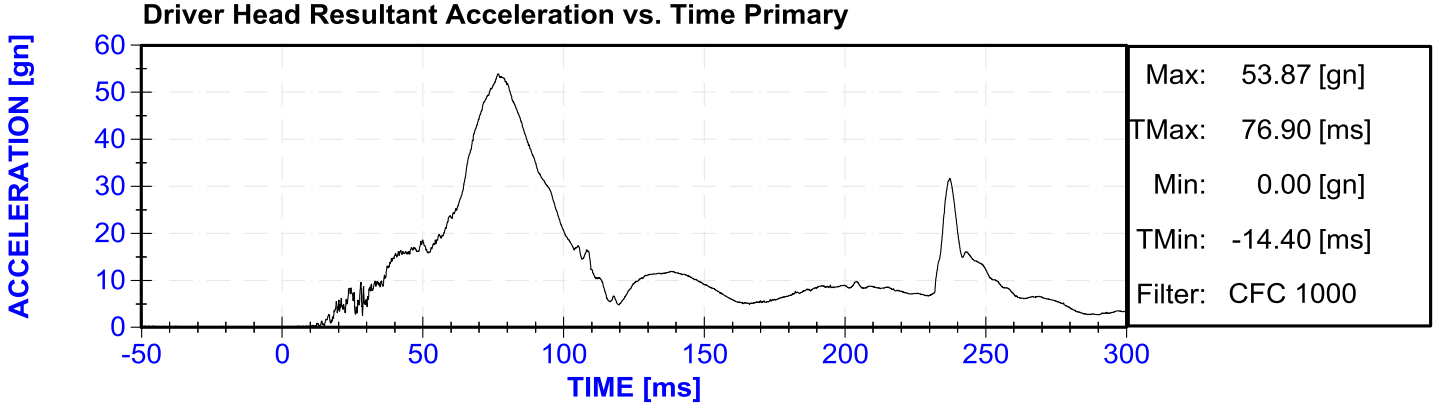
Driver Head Y Acceleration vs. Time Primary



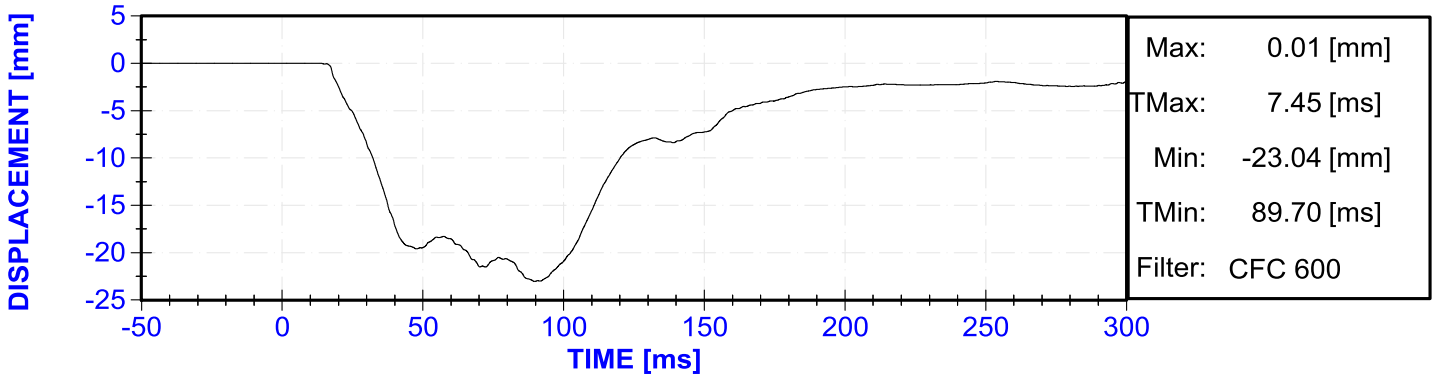
Driver Head Z Acceleration vs. Time Primary



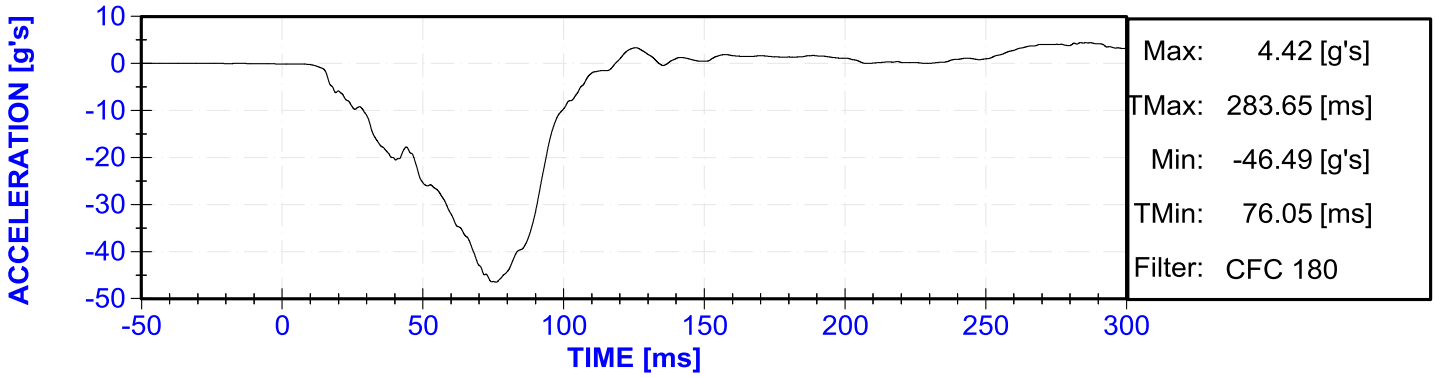
Driver Head Resultant Acceleration vs. Time Primary



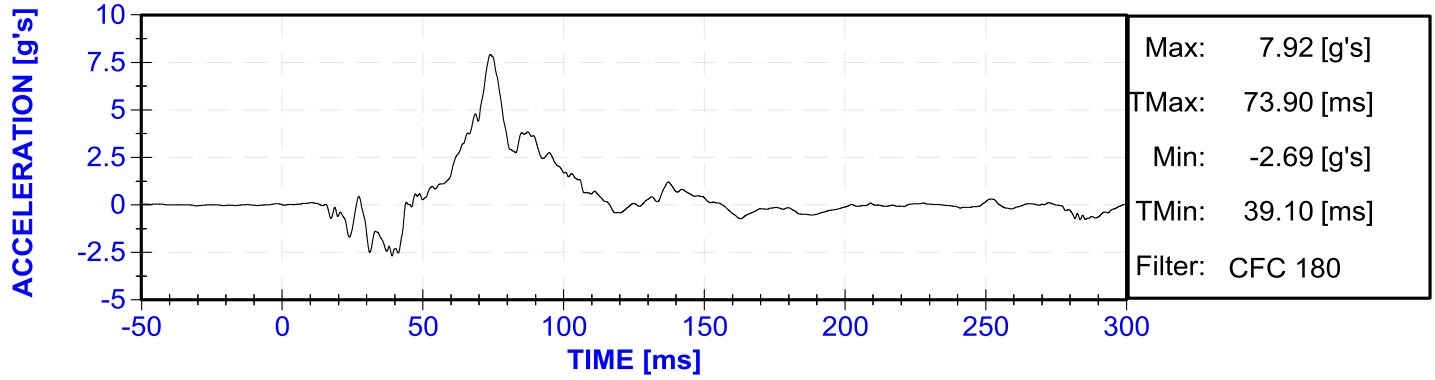
Driver Chest X Deflection vs. Time



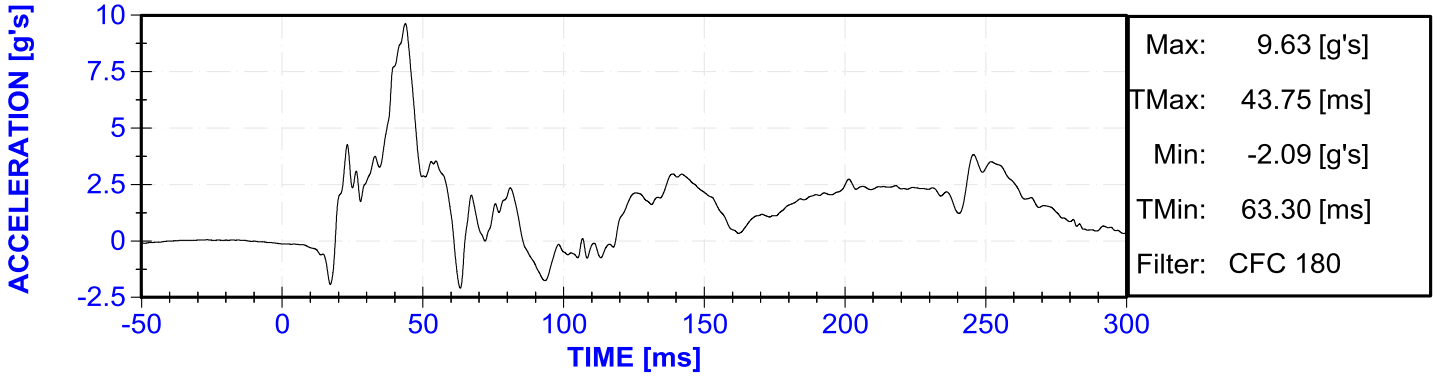
Driver Chest X Acceleration vs. Time Primary



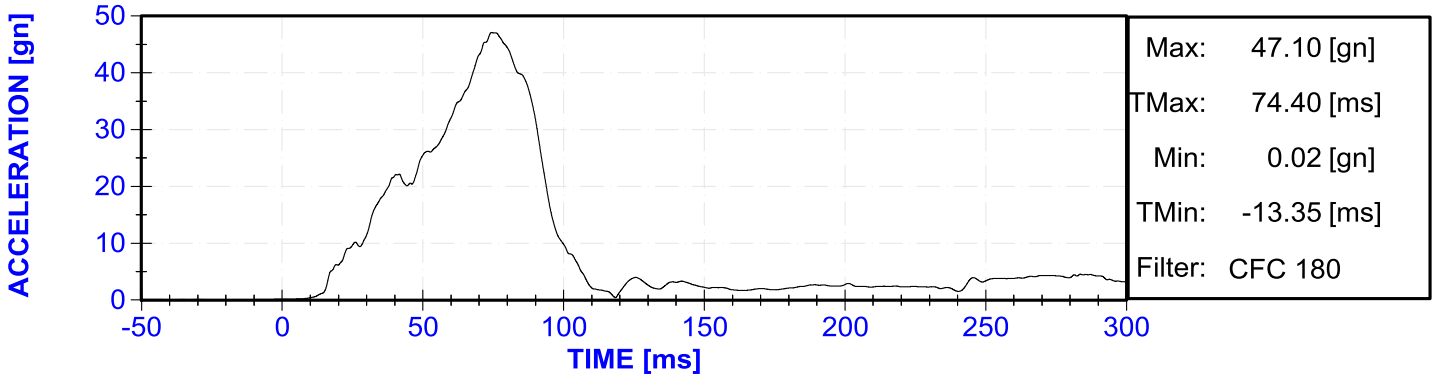
Driver Chest Y Acceleration vs. Time Primary



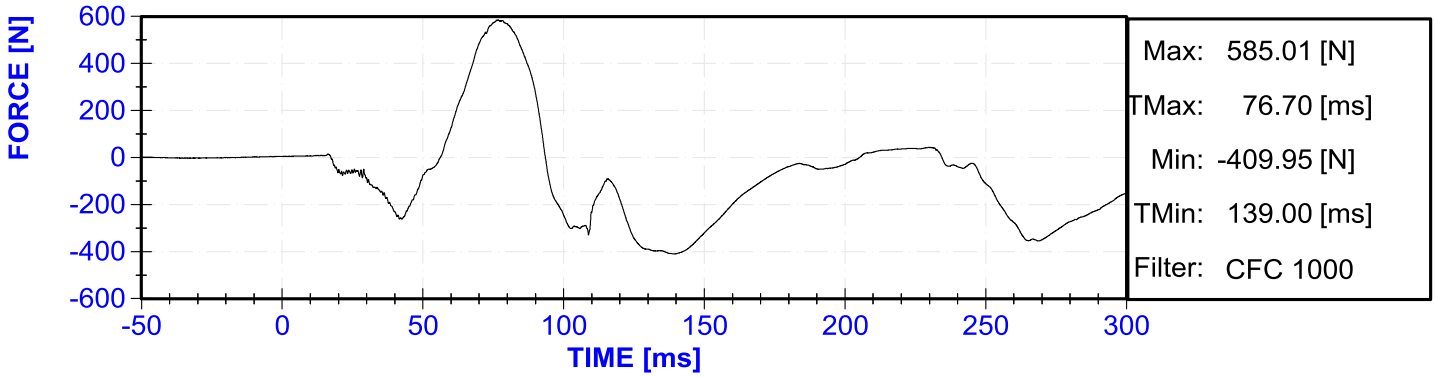
Driver Chest Z Acceleration vs. Time Primary



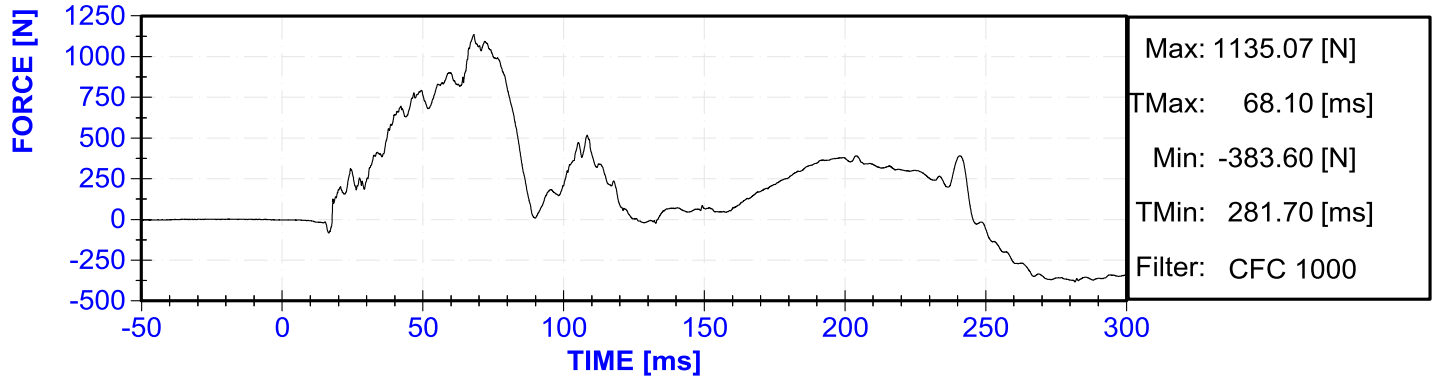
Driver Chest Resultant Acceleration vs. Time Primary



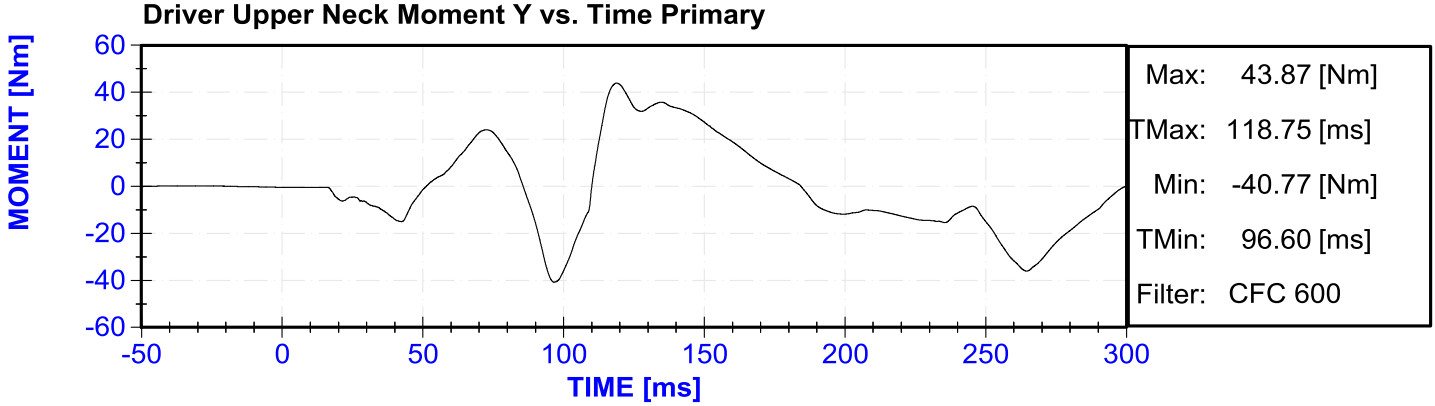
Driver Upper Neck Force X vs. Time Primary



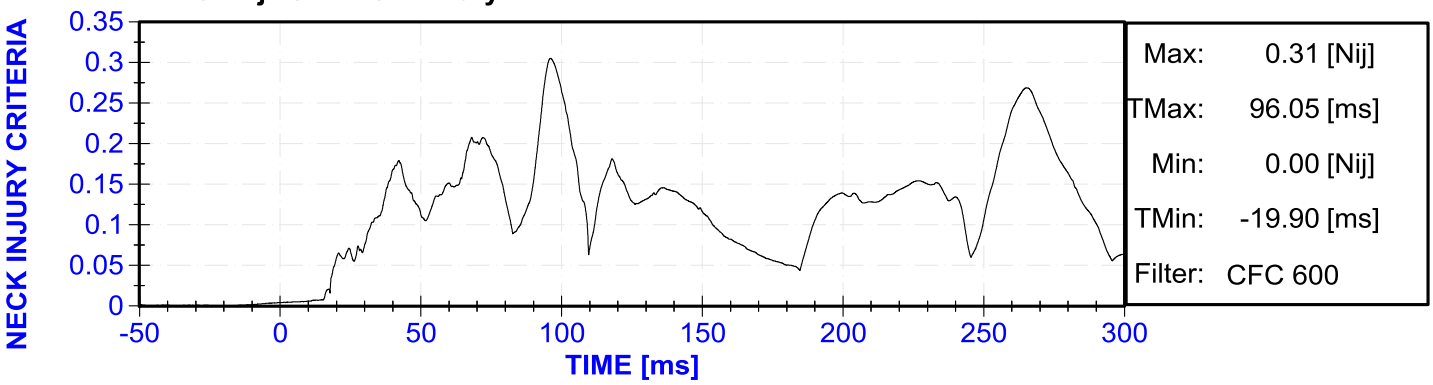
Driver Upper Neck Force Z vs. Time Primary



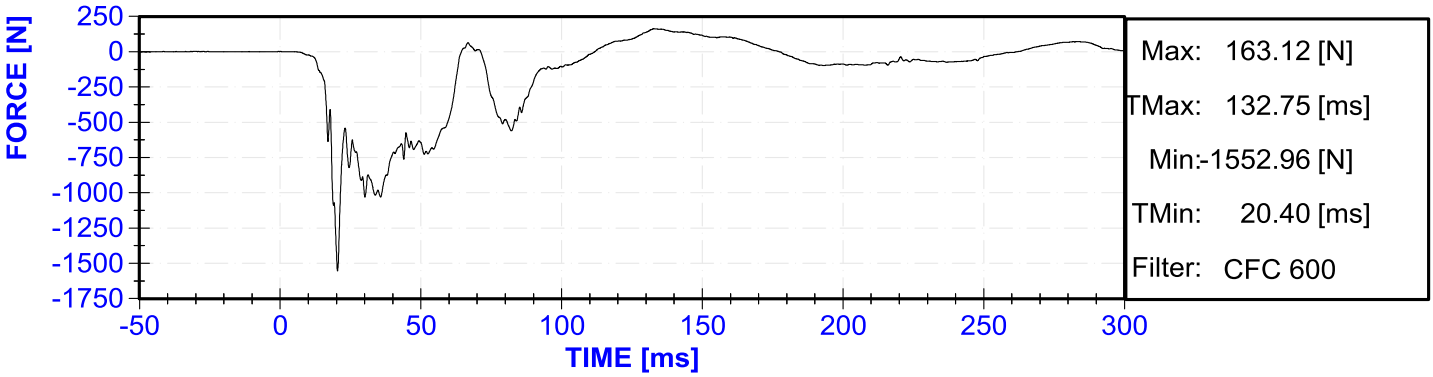
Driver Upper Neck Moment Y vs. Time Primary



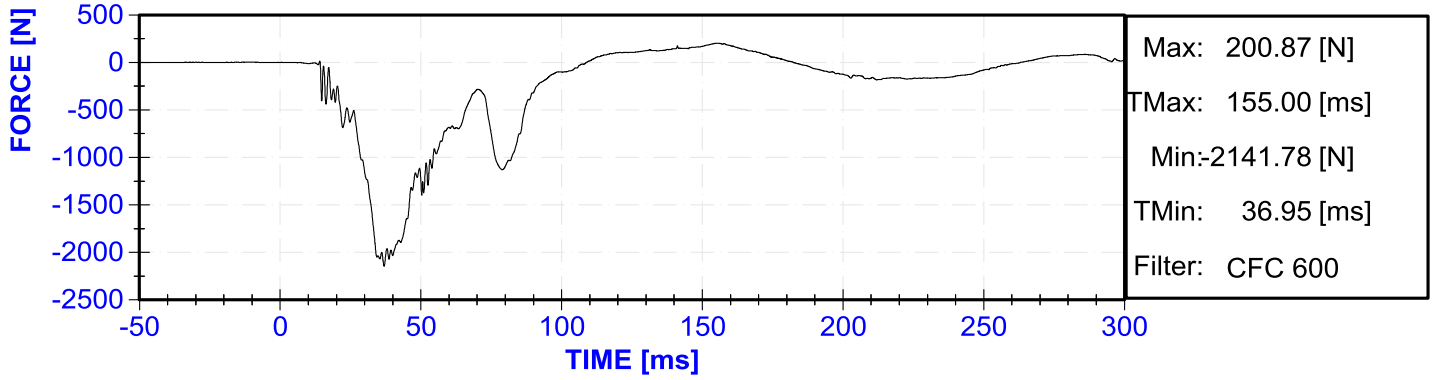
Driver Nij vs. Time Primary



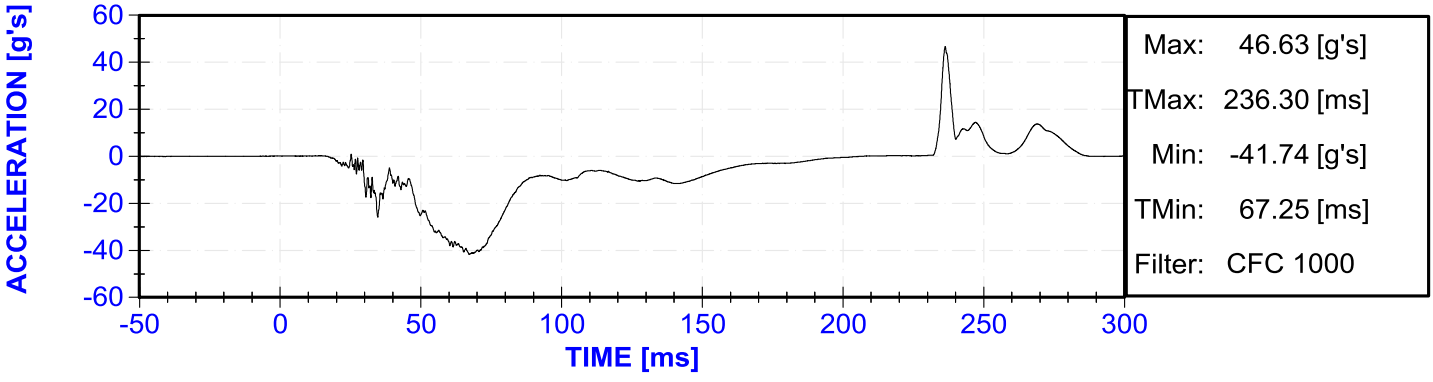
Driver Left Femur Force vs. Time



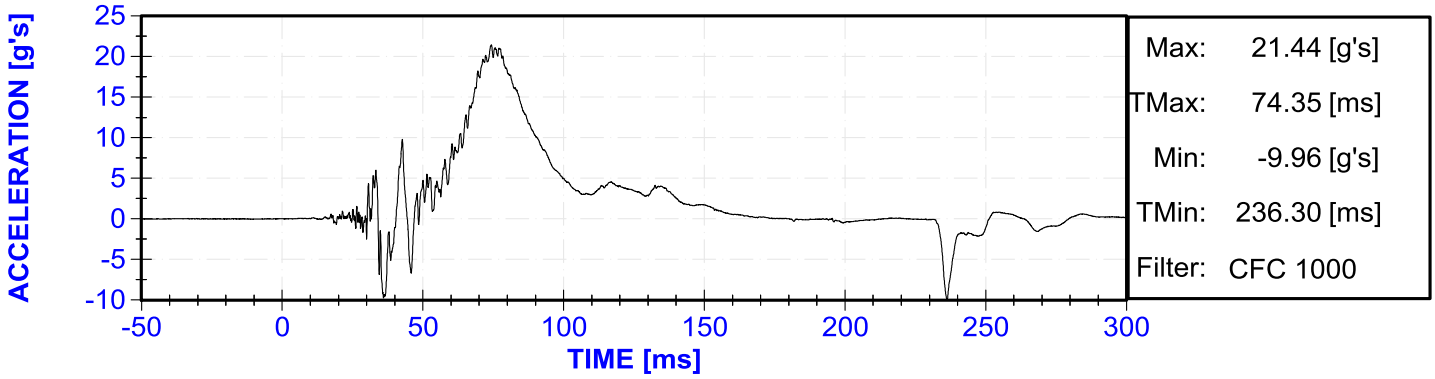
Driver Right Femur Force vs. Time



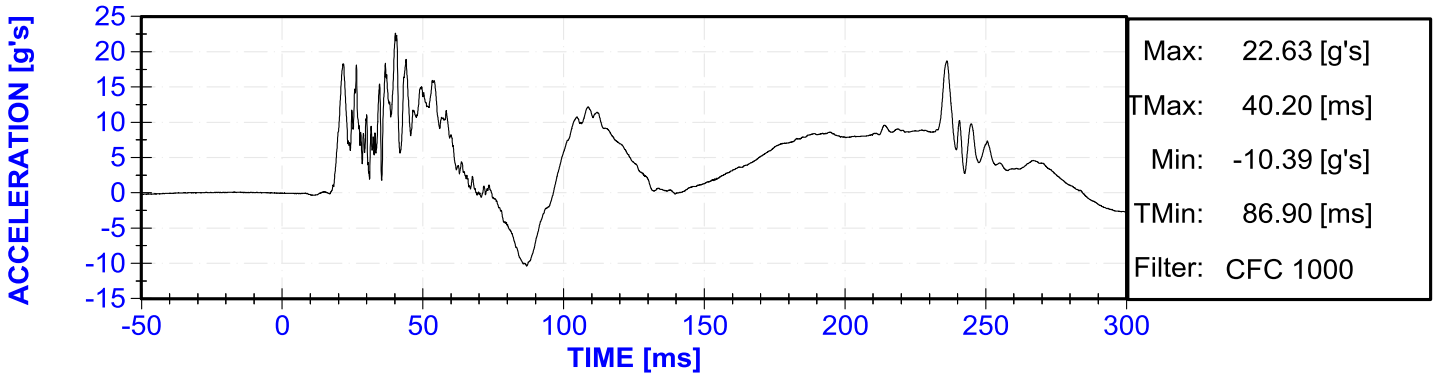
Passenger Head X Acceleration vs. Time Primary



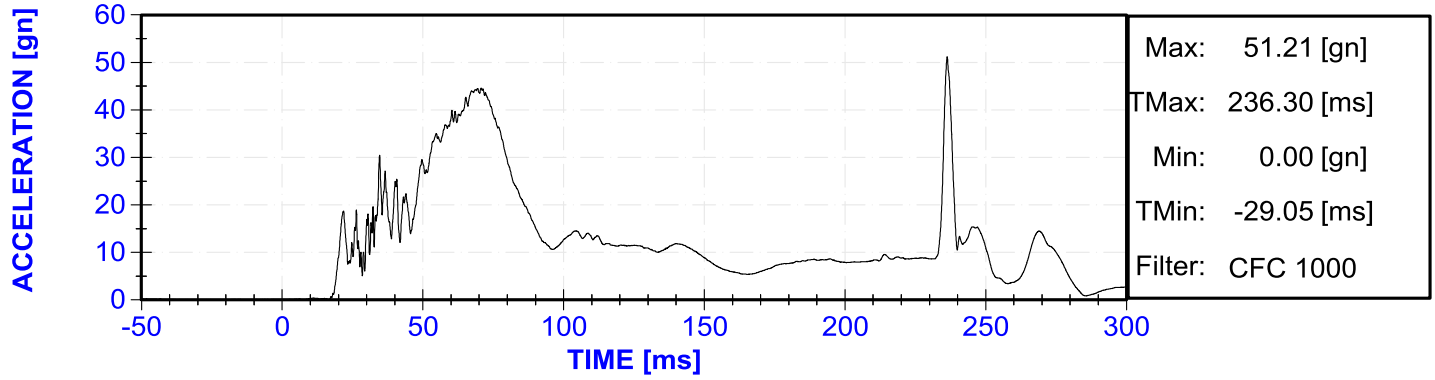
Passenger Head Y Acceleration vs. Time Primary



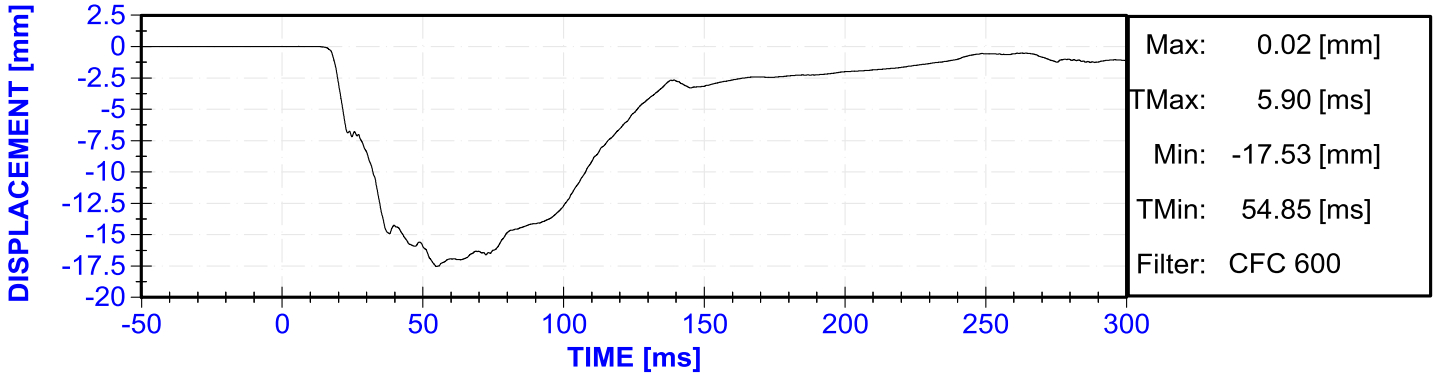
Passenger Head Z Acceleration vs. Time Primary



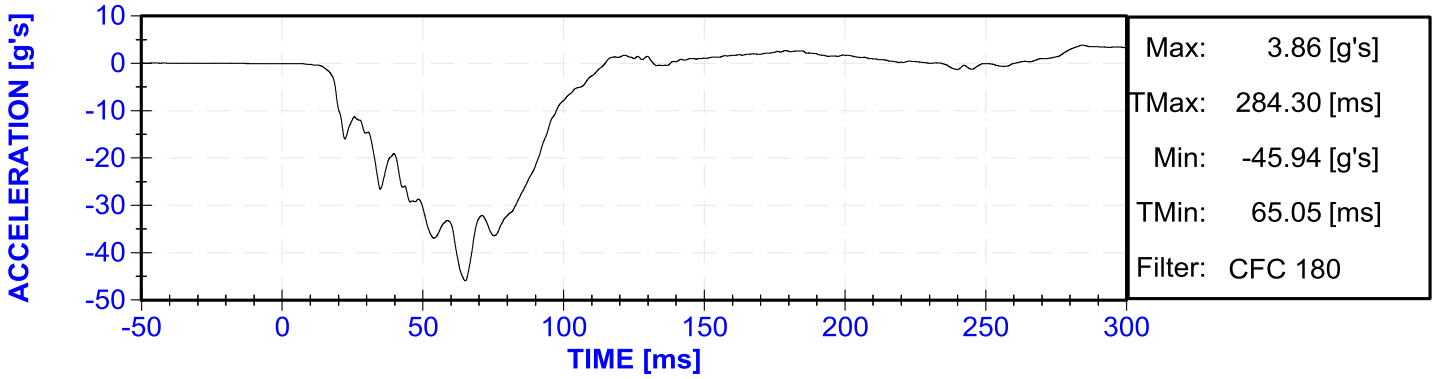
Passenger Head Resultant Acceleration vs. Time Primary



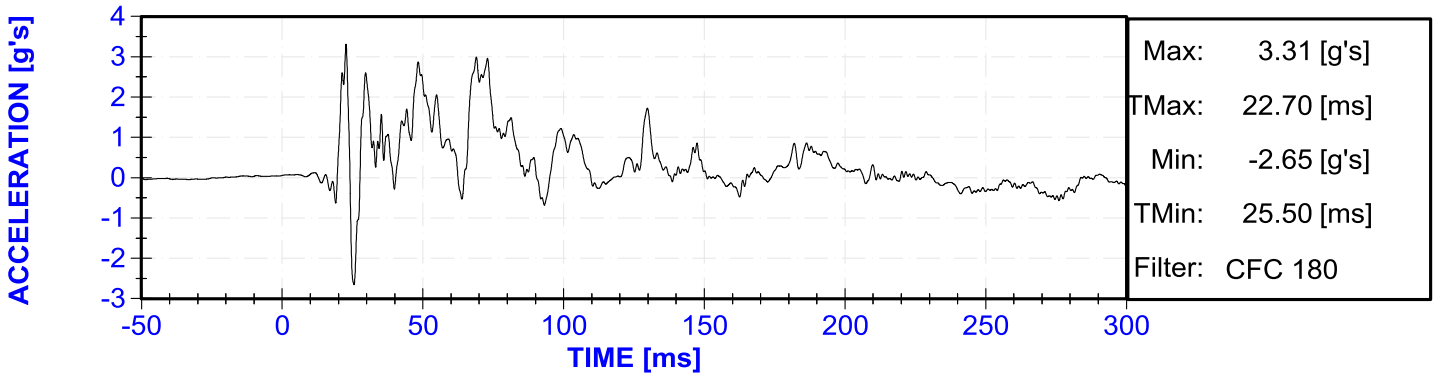
Passenger Chest X Deflection vs. Time



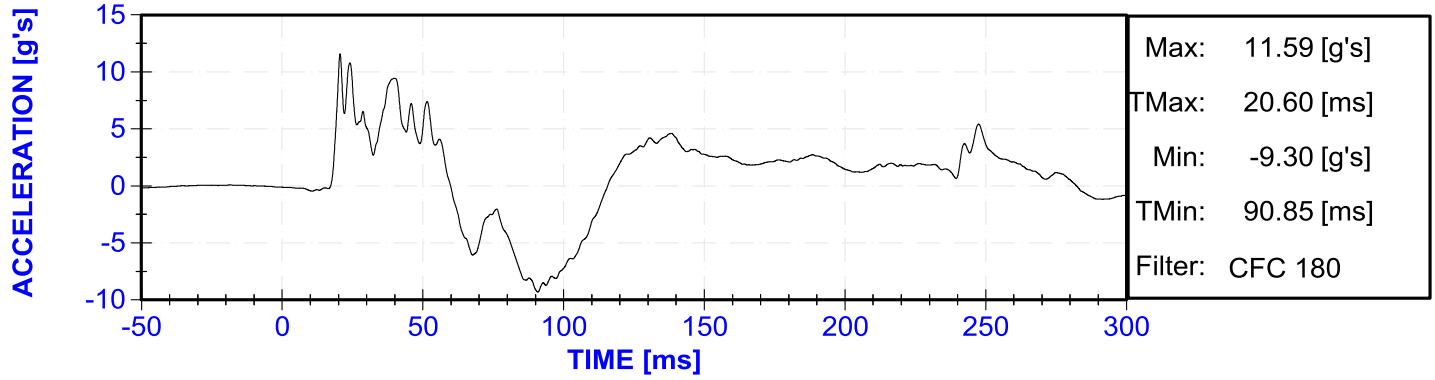
Passenger Chest X Acceleration vs. Time Primary



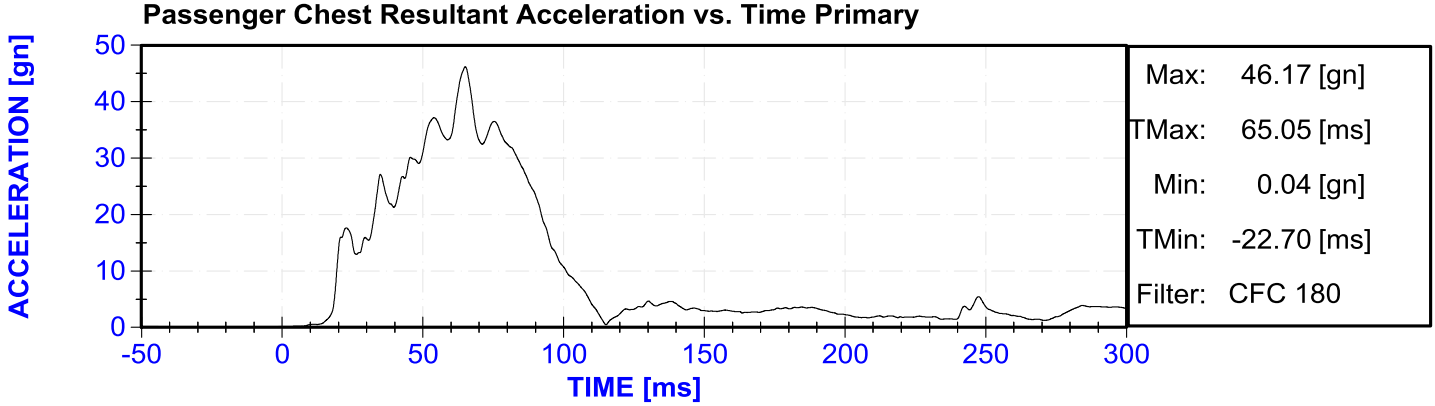
Passenger Chest Y Acceleration vs. Time Primary



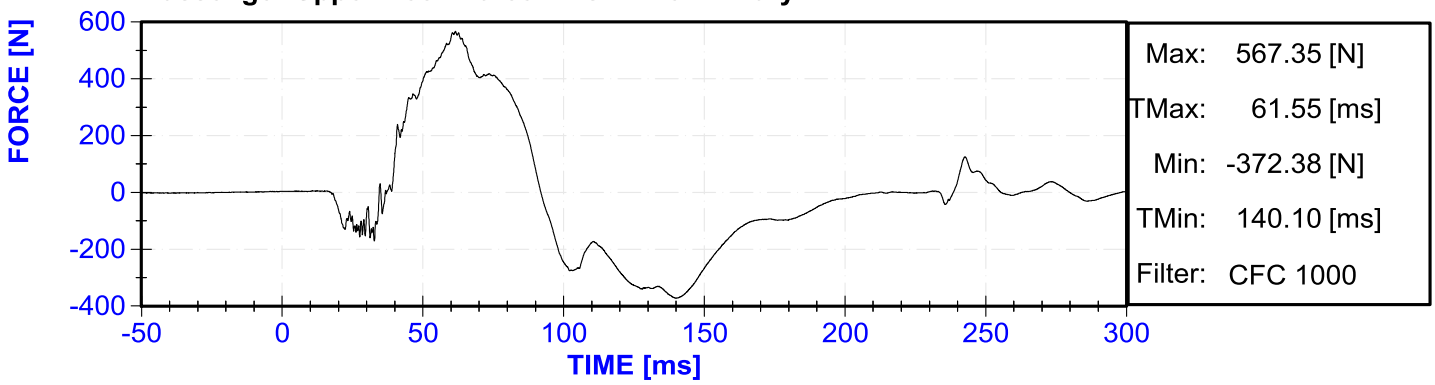
Passenger Chest Z Acceleration vs. Time Primary



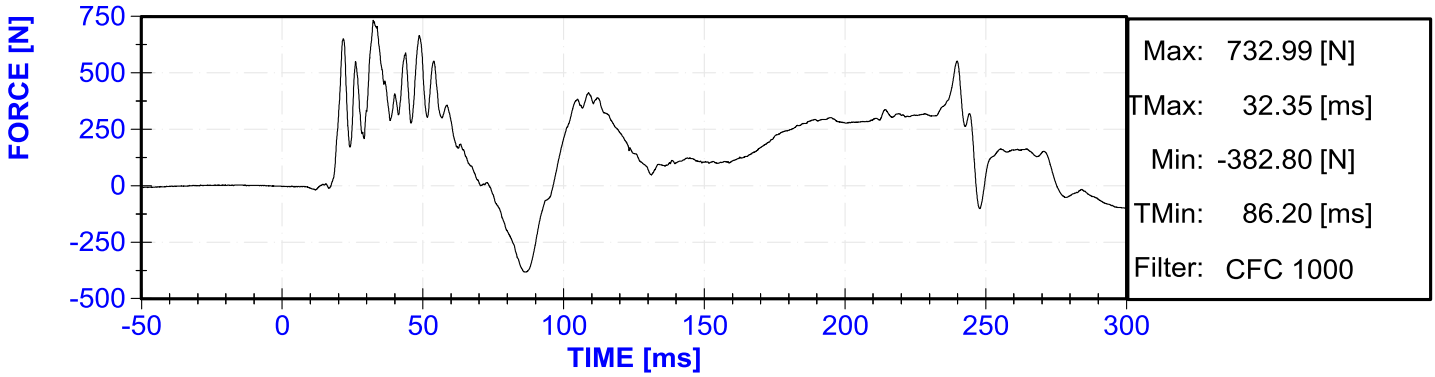
Passenger Chest Resultant Acceleration vs. Time Primary



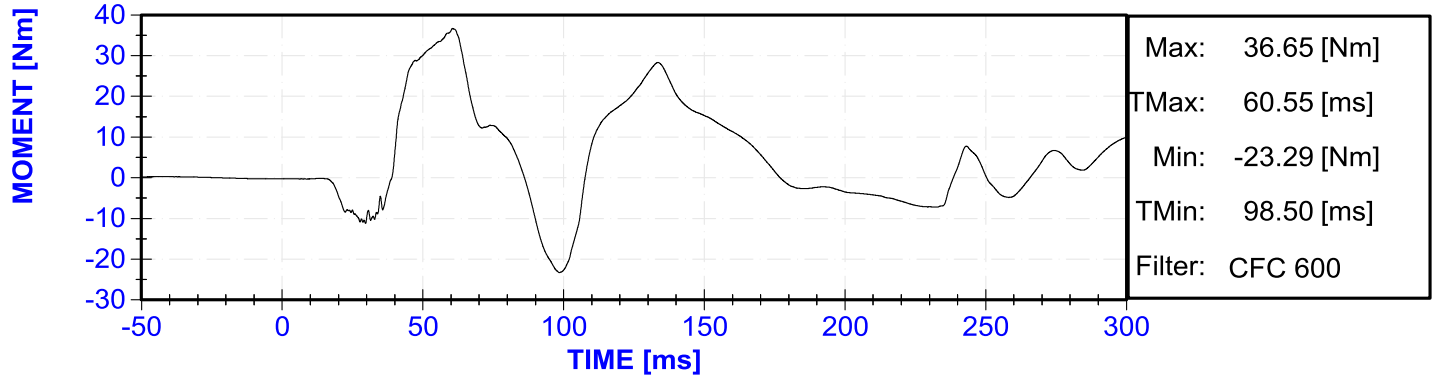
Passenger Upper Neck Force X vs. Time Primary



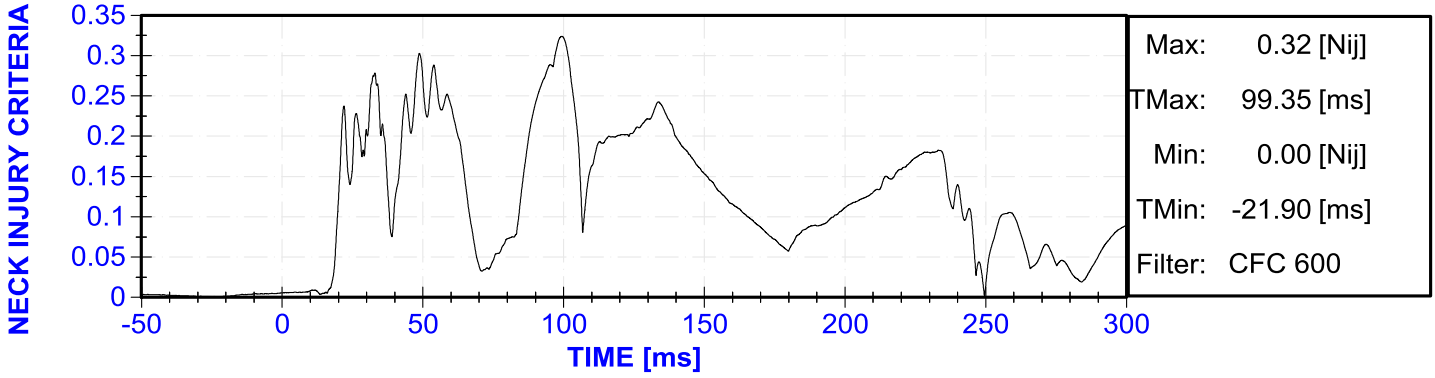
Passenger Upper Neck Force Z vs. Time Primary

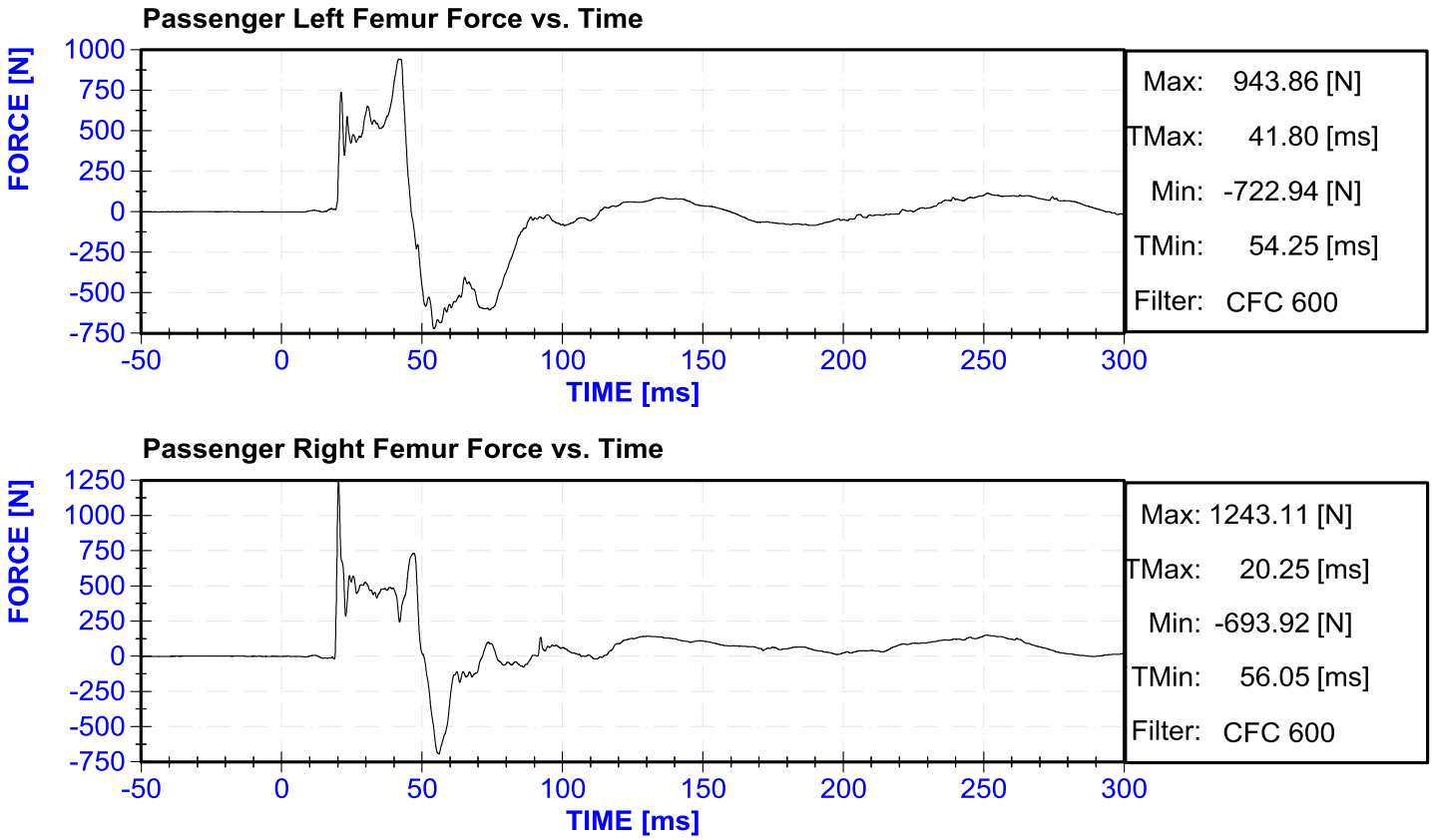


Passenger Upper Neck Moment Y vs. Time Primary



Passenger Nij vs. Time Primary




Passenger Left Femur Force vs. Time
FORCE [N]
1000
750
500
250
0
-250
-500
-750
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 943.86 [N]
TMax: 41.80 [ms]
Min: -722.94 [N]
TMin: 54.25 [ms]
Filter: CFC 600
Passenger Right Femur Force vs. Time
FORCE [N]
1250
1000
750
500
250
0
-250
-500
-750
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1243.11 [N]
TMax: 20.25 [ms]
Min: -693.92 [N]
TMin: 56.05 [ms]
Filter: CFC 600

APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

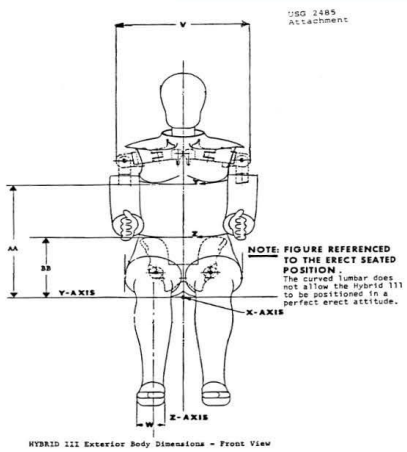
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046

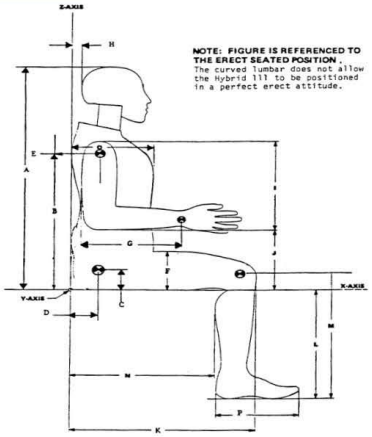
External Measurements - Hybrid 3 - 50th Male

Technician: M.Hartung Date: 1/31/2017

Dummy Serial Number: 1046



HYBRID III Exterior Body Dimensions - Front View



HYBRID III Exterior Body Dimensions - Side View

Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.7	Pass
B	Shoulder Pivot Height	19.9	20.5	20.1	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	5.7	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.9	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.4	Pass
J	Elbow Rest Height	7.5	8.3	8.1	Pass
K	Buttock to Knee Length	22.8	23.8	23.1	Pass
L	Popliteal Height	16.9	17.9	17.5	Pass
M	Knee Pivot Height	19.1	19.7	19.3	Pass
N	Buttock Popliteal Length	17.8	18.8	18.1	Pass
O	Chest Depth without Jacket	8.4	9.0	8.7	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	16.8	Pass
W	Foot Breadth	3.6	4.2	3.9	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.9	Pass
Z	Waist Circumference	32.9	34.1	33.4	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

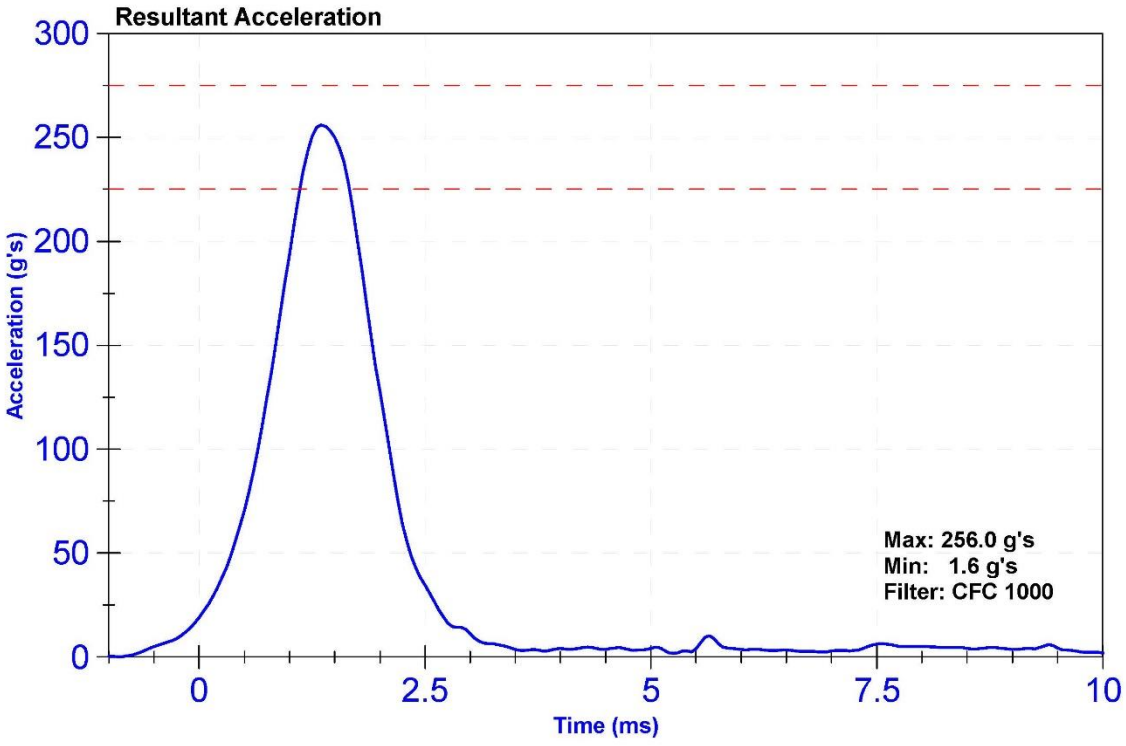
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

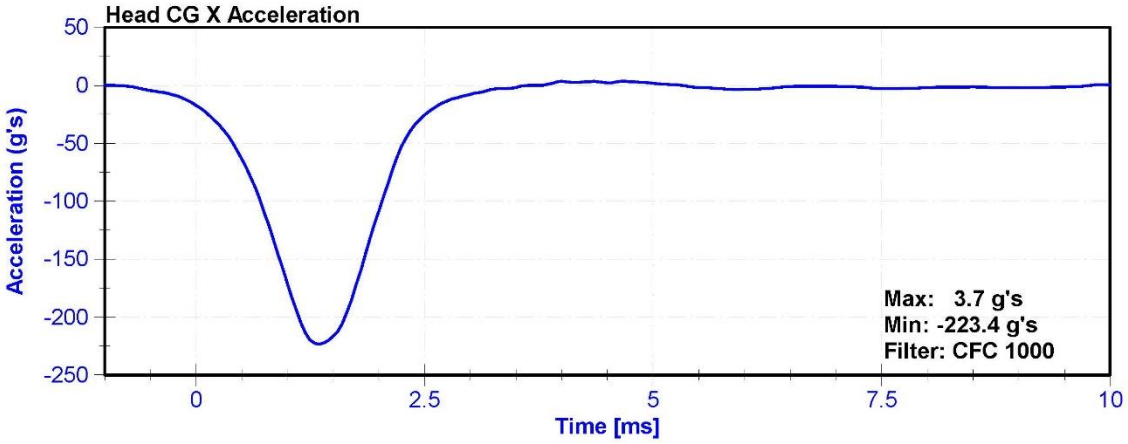
Results

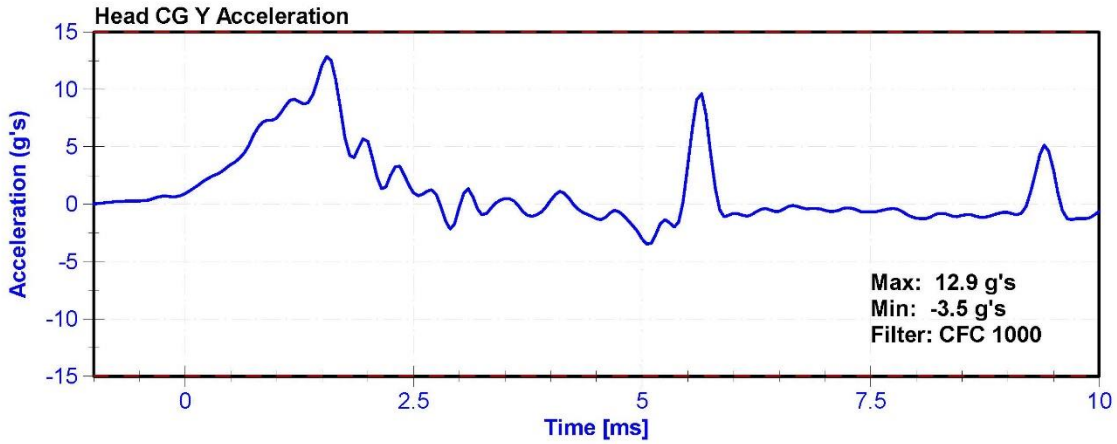
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	31.3	Pass
Resultant Acceleration	225	275	g's	256.0	Pass
Oscillation	0	10	%	3.9	Pass
Lateral Acceleration	-15	15	g's	12.9	Pass

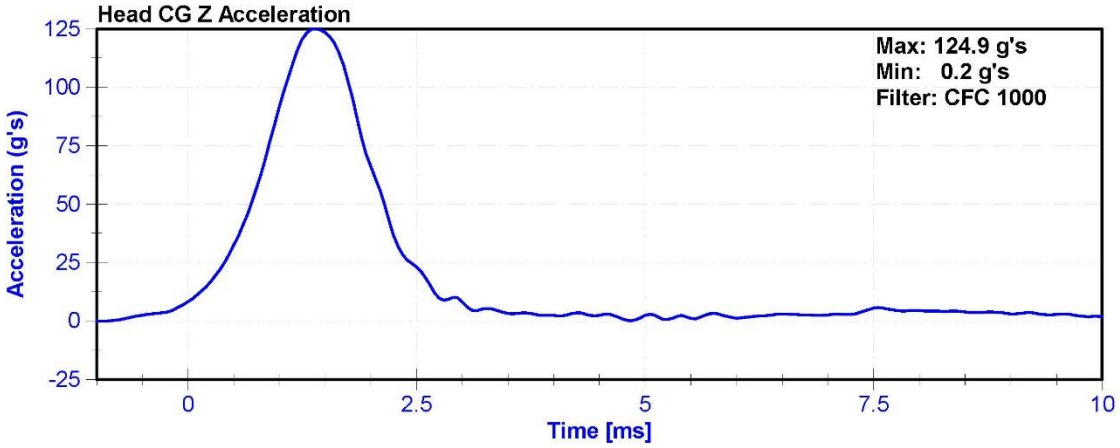
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58871	9/19/2016	3/20/2017
Y Accelerometer	ENDEVCO 7264	AC-P12359	9/19/2016	3/20/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P52133	9/19/2016	3/20/2017




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 3.7 g's
Min: -223.4 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 12.9 g's
Min: -3.5 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 124.9 g's
Min: 0.2 g's
Filter: CFC 1000

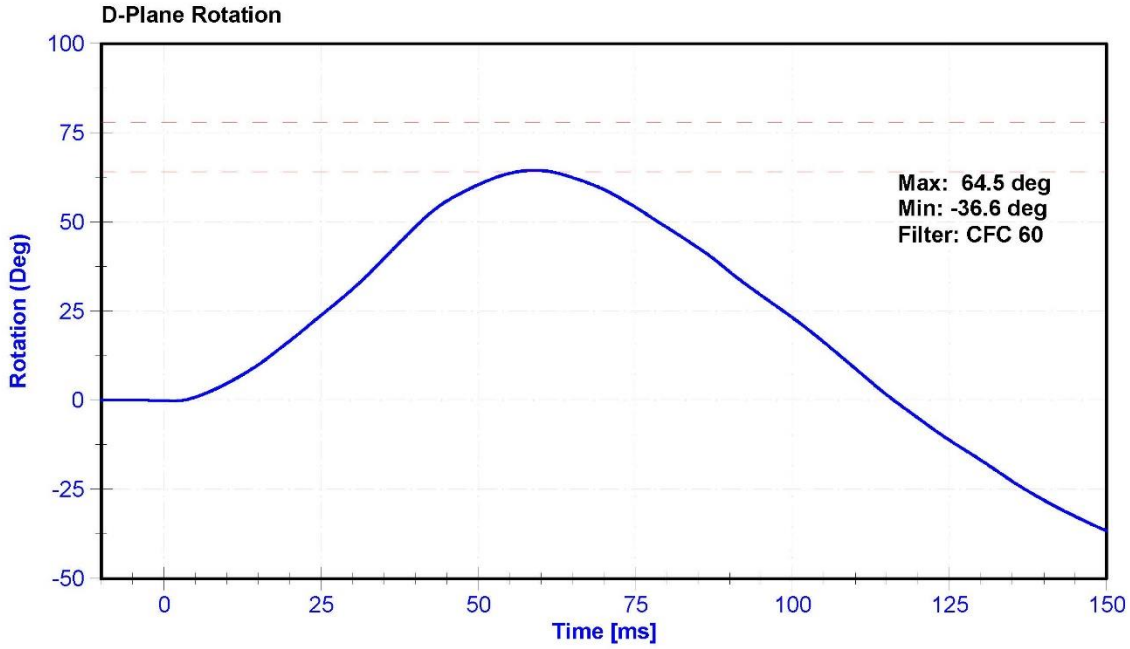
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

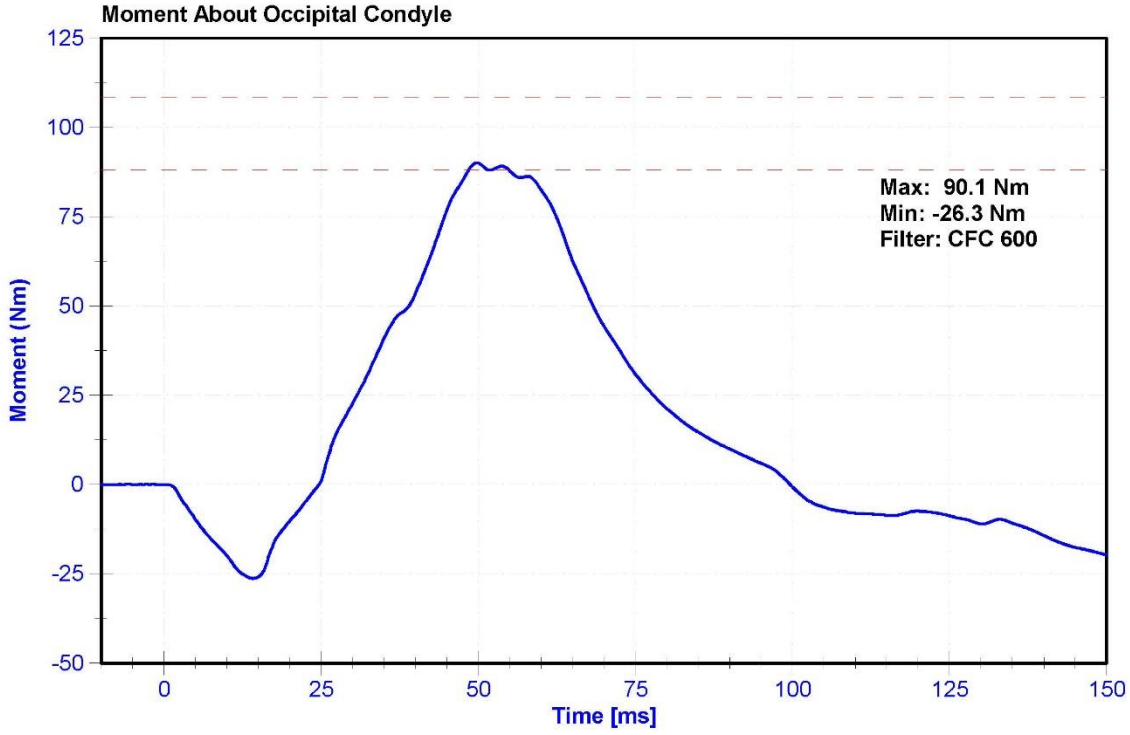
Results

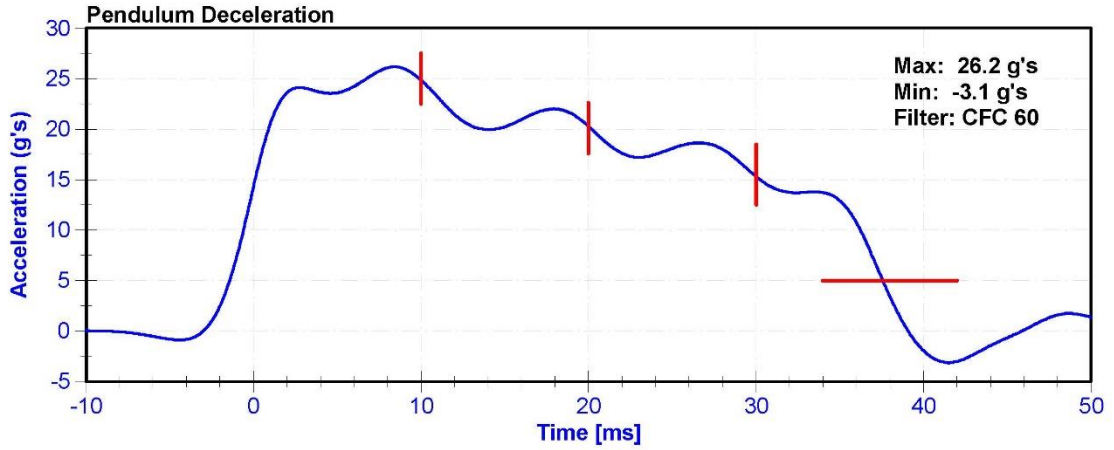
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	32.3	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	24.87	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	20.27	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.31	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	26.2	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	37.6	Pass
Maximum D Plane Rotation	64	78	deg	64.5	Pass
Time to Maximum Rotation	57	64	ms	59.0	Pass
Rotation Decay to Zero	113	127	ms	116.2	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	90.08	Pass
Time to Maximum Moment	47	58	ms	49.9	Pass
Moment Decay to Zero	97	107	ms	99.7	Pass

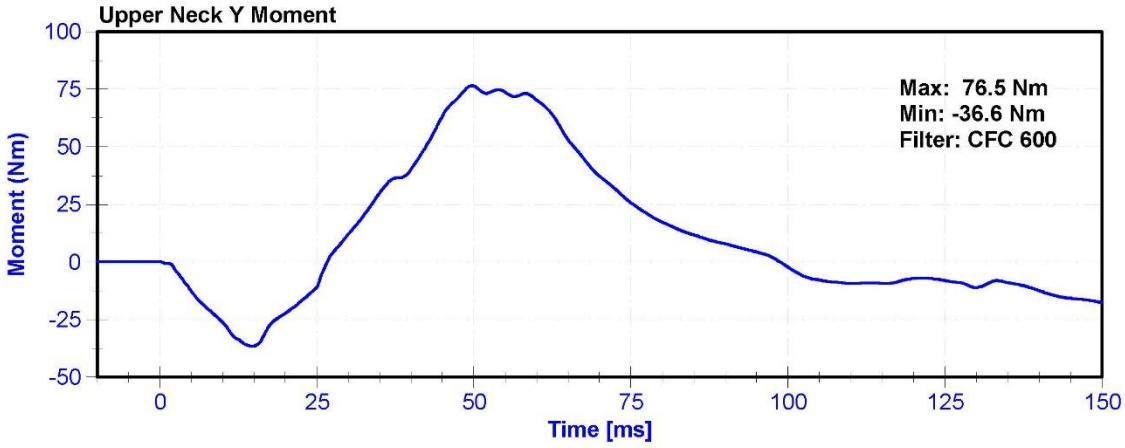
Transducer Calibrations

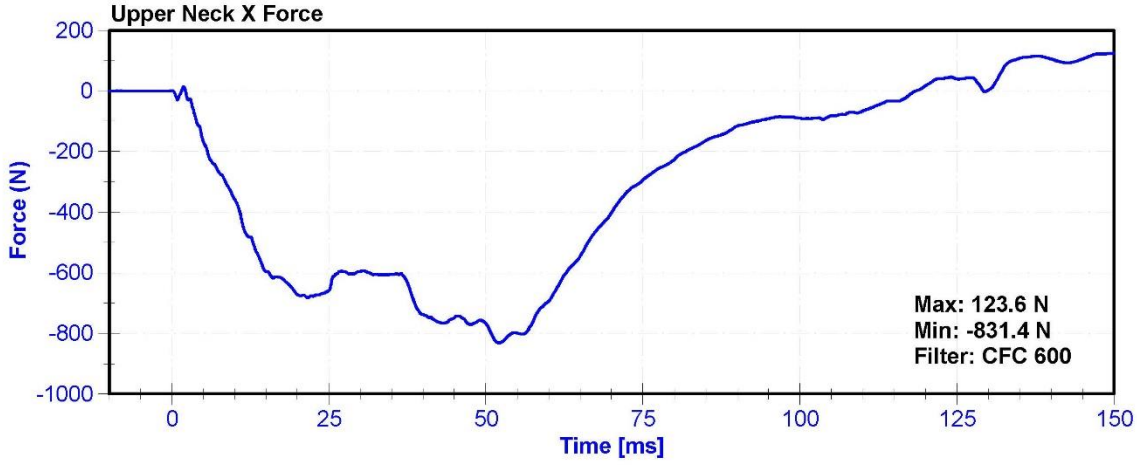
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 64.5 deg
Min: -36.6 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 90.1 Nm
Min: -26.3 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 26.2 g's
Min: -3.1 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 76.5 Nm
Min: -36.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 123.6 N
Min: -831.4 N
Filter: CFC 600
Force (N)
Time [ms]

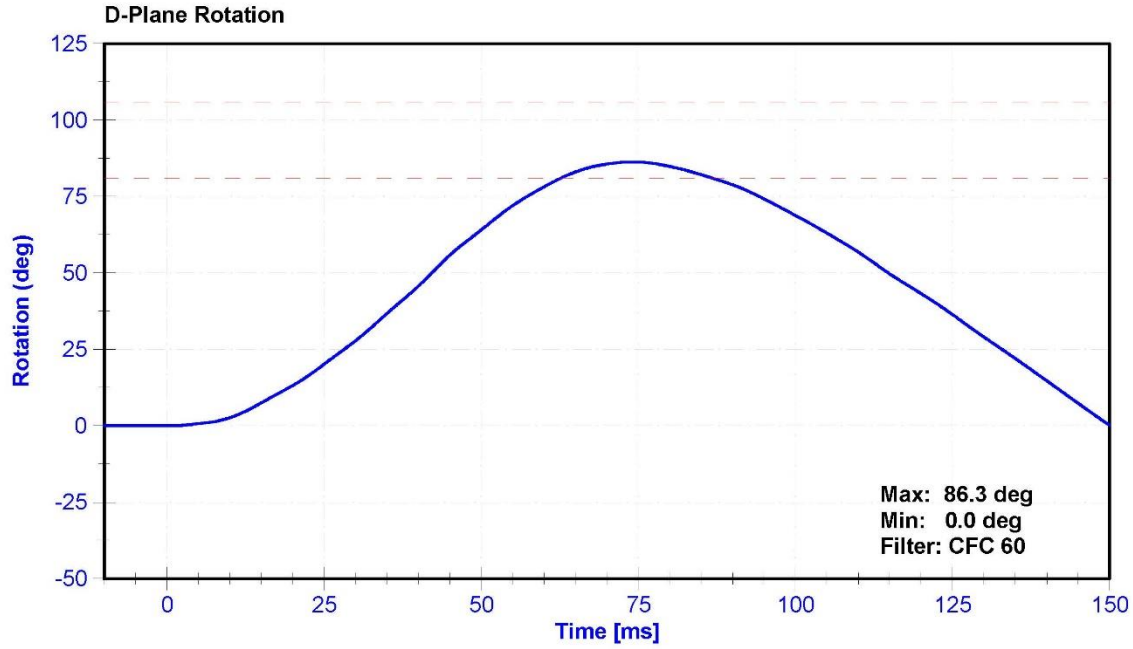
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

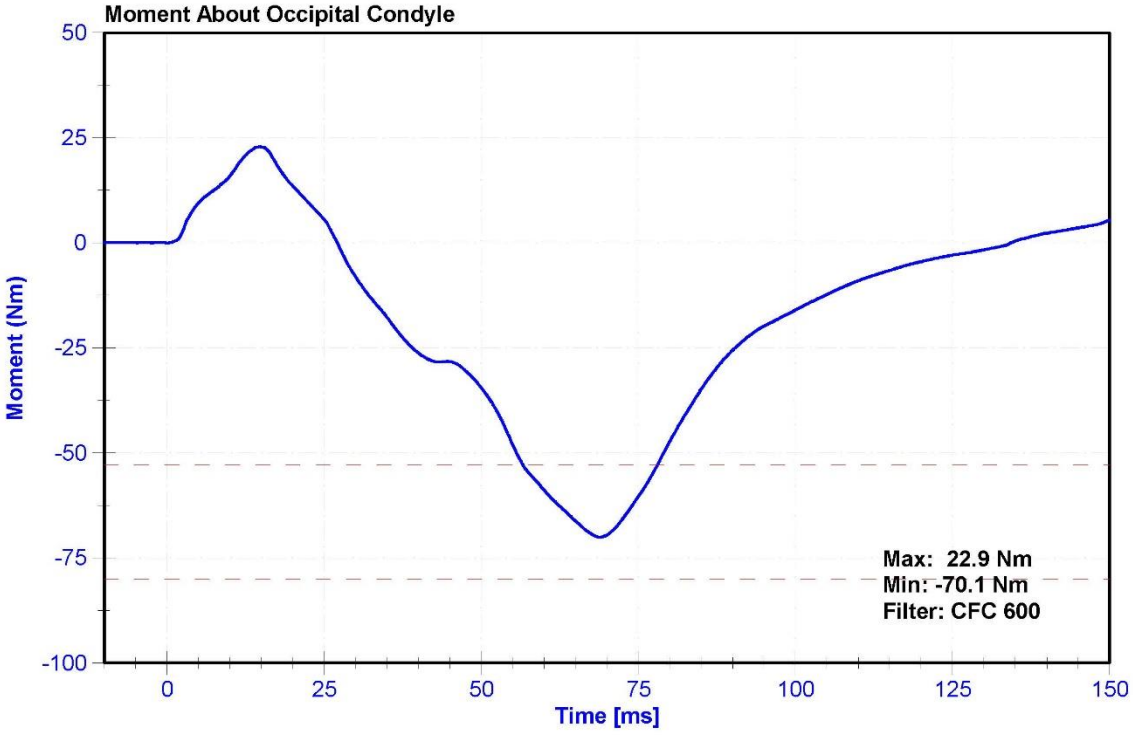
Results

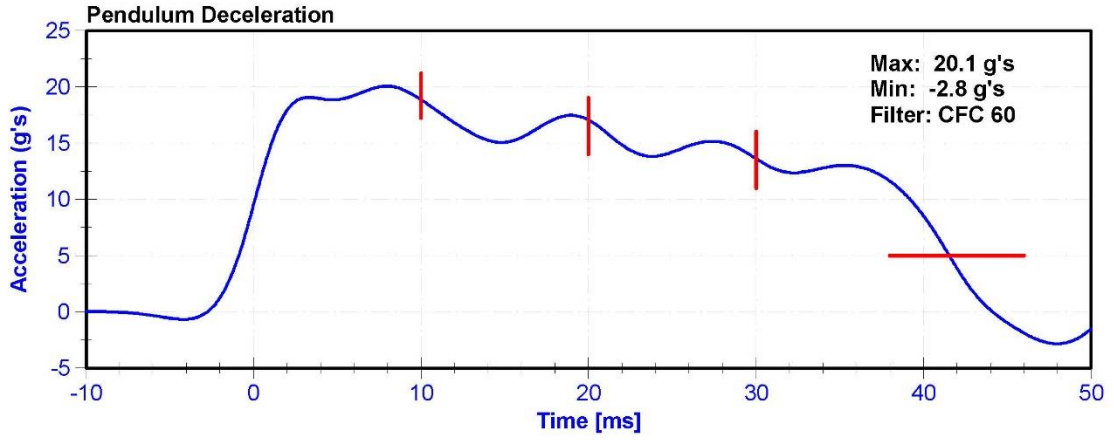
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	28.2	Pass
Velocity	5.94	6.19	m/s	6.068	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	18.86	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.1	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.6	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.1	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	41.5	Pass
Maximum D Plane Rotation	81	106	deg	86.3	Pass
Time to Maximum Rotation	72	82	ms	74.1	Pass
Rotation Decay to Zero	147	174	ms	150.1	Pass
Minimum Moment About OC	-80	-52.9	Nm	-70.08	Pass
Time to Minimum Moment	65	79	ms	68.9	Pass
Moment Decay to Zero	120	148	ms	134.3	Pass

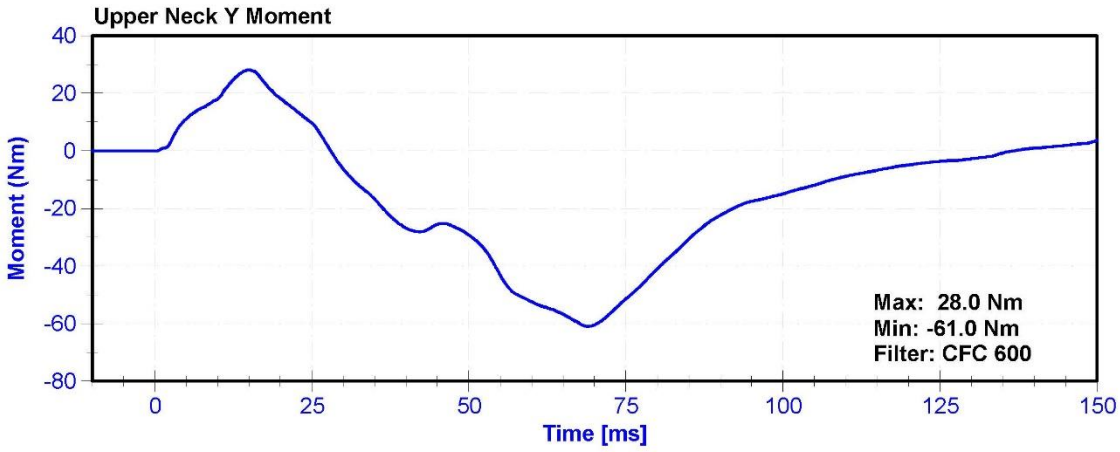
Transducer Calibrations

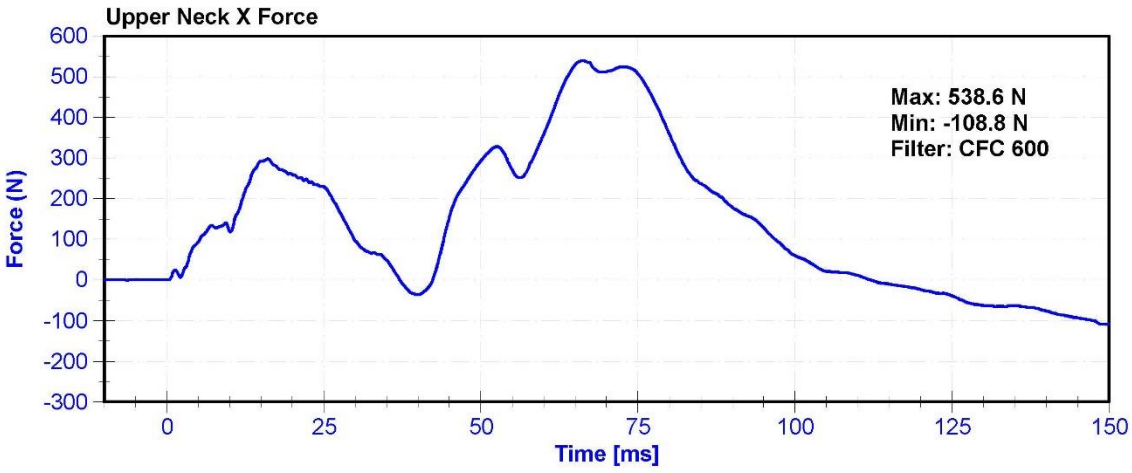
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 86.3 deg
Min: 0.0 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 22.9 Nm
Min: -70.1 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 20.1 g's
Min: -2.8 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 28.0 Nm
Min: -61.0 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 538.6 N
Min: -108.8 N
Filter: CFC 600
Force (N)
Time [ms]

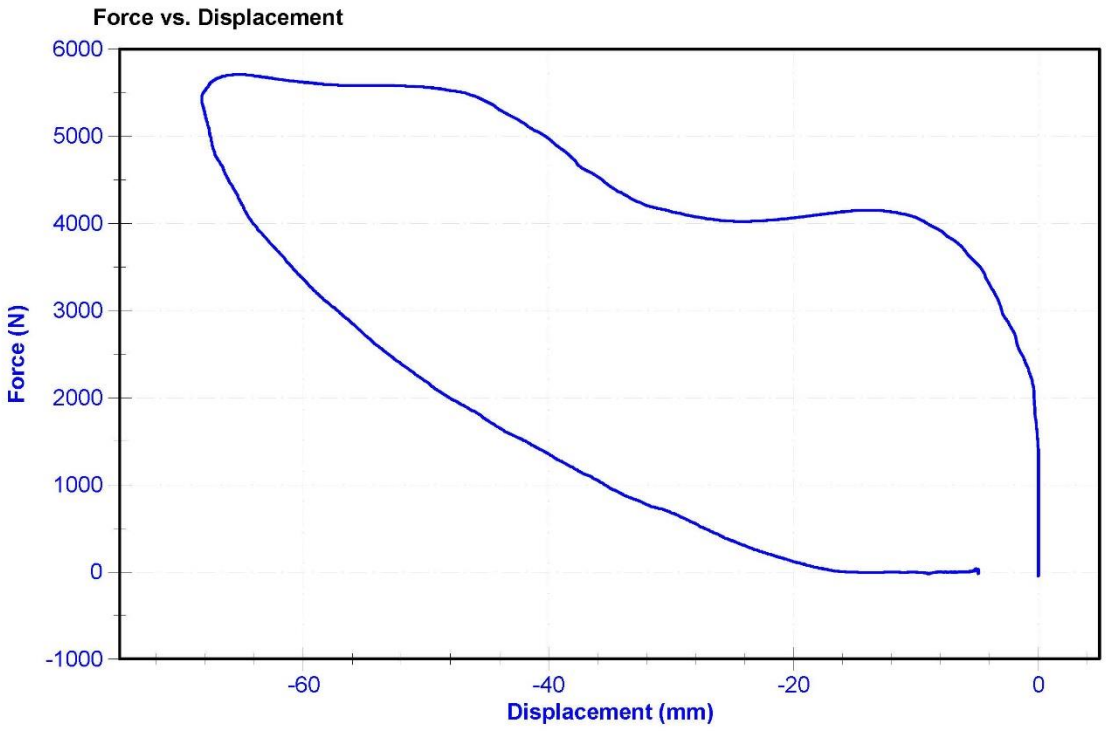
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

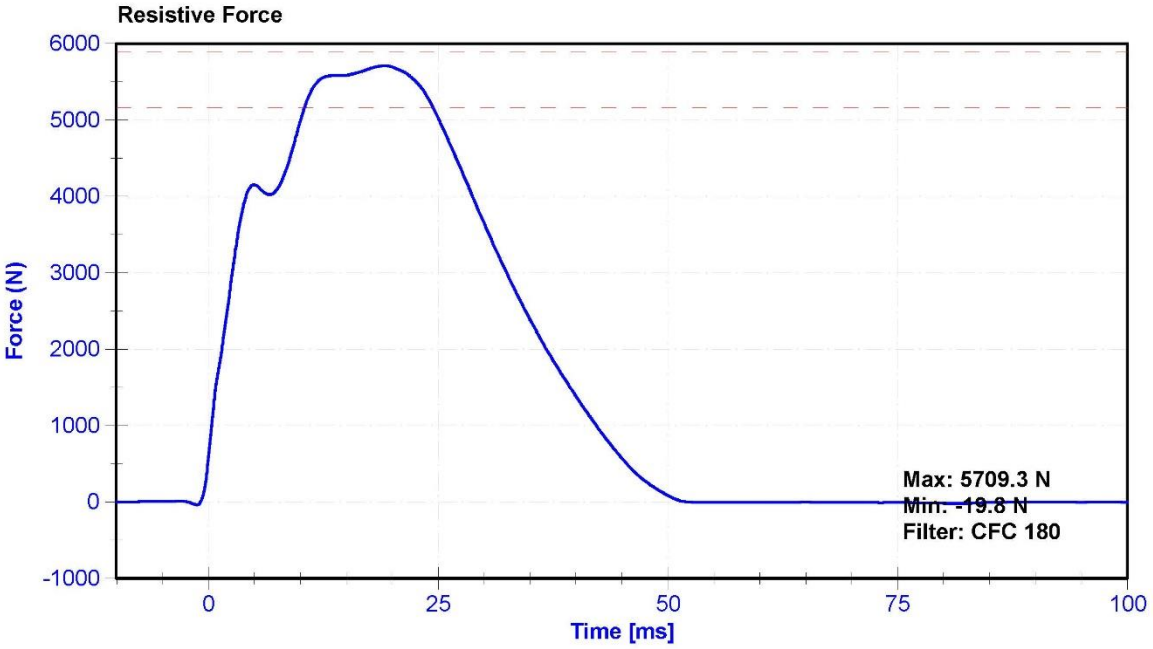
Results

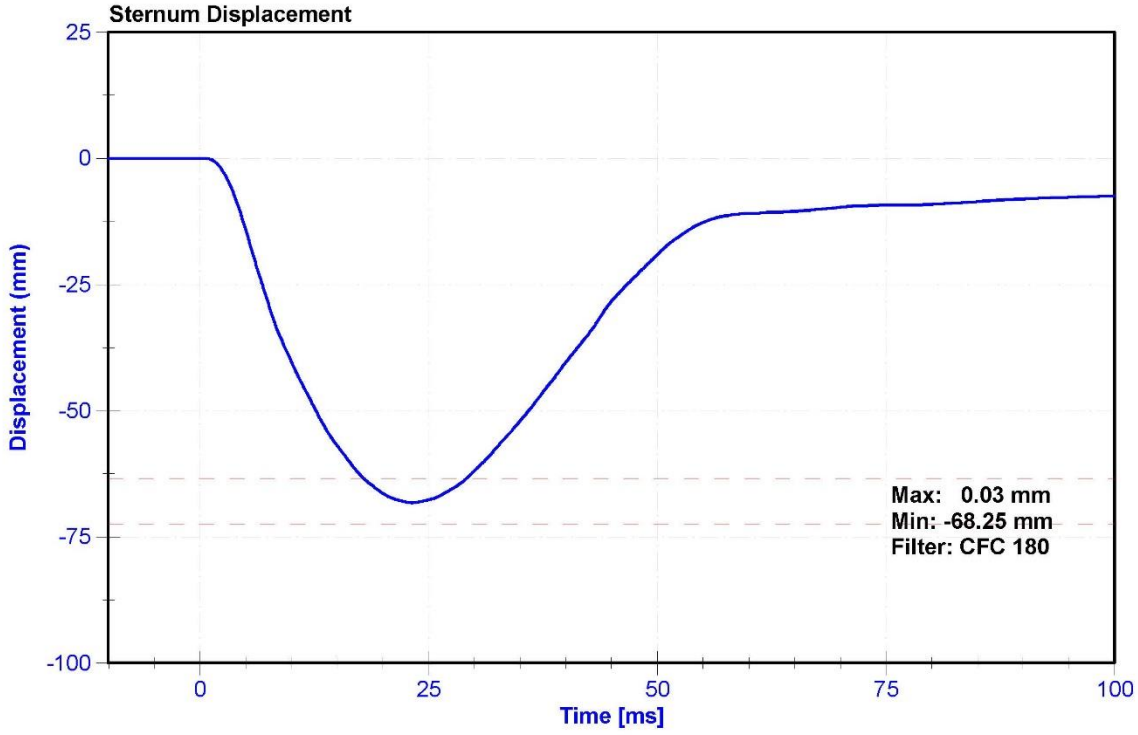
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.9	Pass
Velocity	6.59	6.83	m/s	6.655	Pass
Chest Displacement	-72.6	-63.5	mm	-68.25	Pass
Resistive Force	5160	5894	N	5709.3	Pass
Hysteresis	65	85	%	70.7	Pass

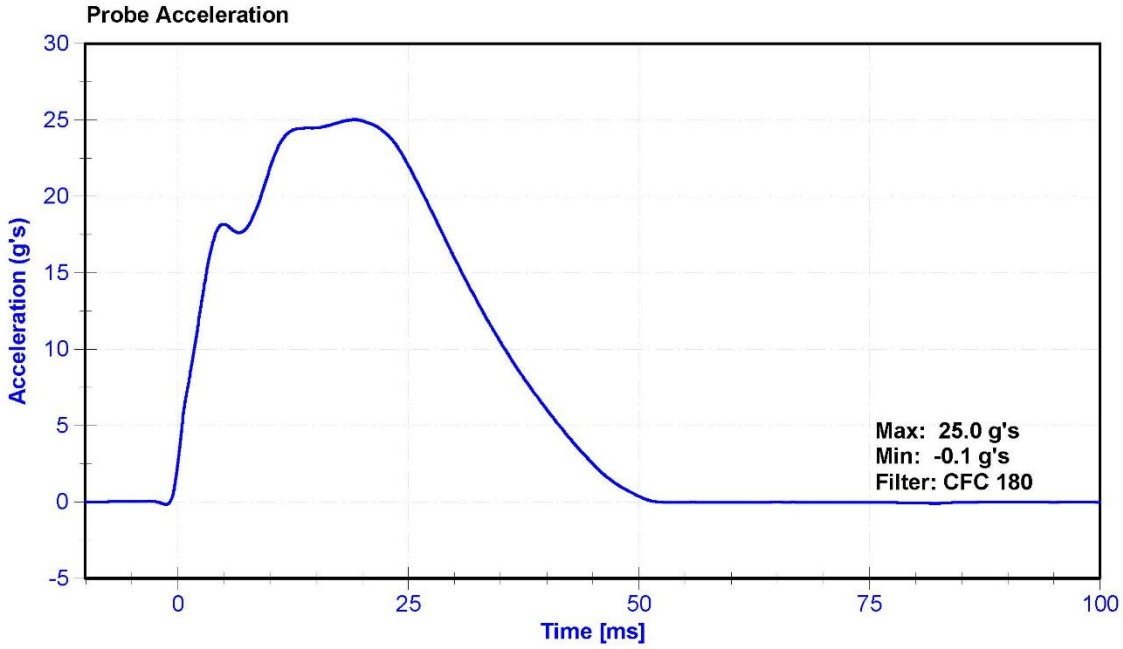
Transducer Calibrations

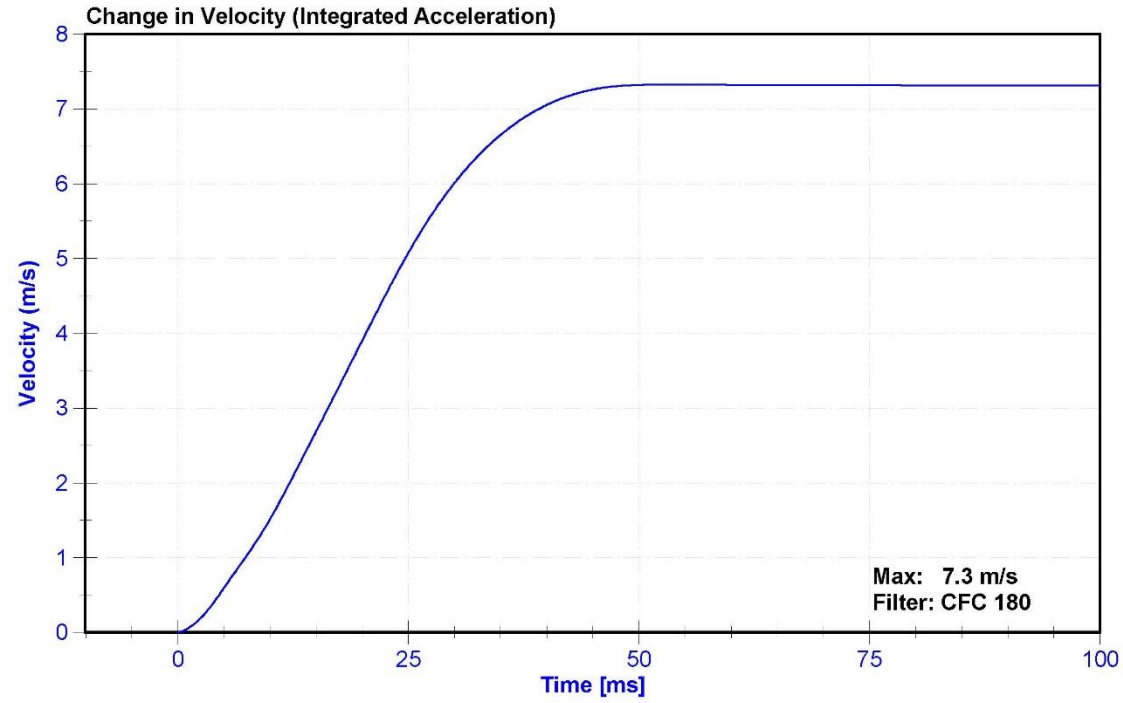
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	Servo 14CB1-2897	DS-1046	9/19/2016	9/19/2017




Resistive Force
6000
5000
4000
3000
2000
1000
0
-1000
Force (N)
0
25
50
75
100
Time [ms]
Max: 5709.3 N
Min: -19.8 N
Filter: CFC 180


Sternum Displacement
25
0
-25
-50
-75
-100
Displacement (mm)
0
25
50
75
100
Time [ms]
Max: 0.03 mm
Min: -68.25 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
30
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 25.0 g's
Min: -0.1 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.3 m/s
Filter: CFC 180

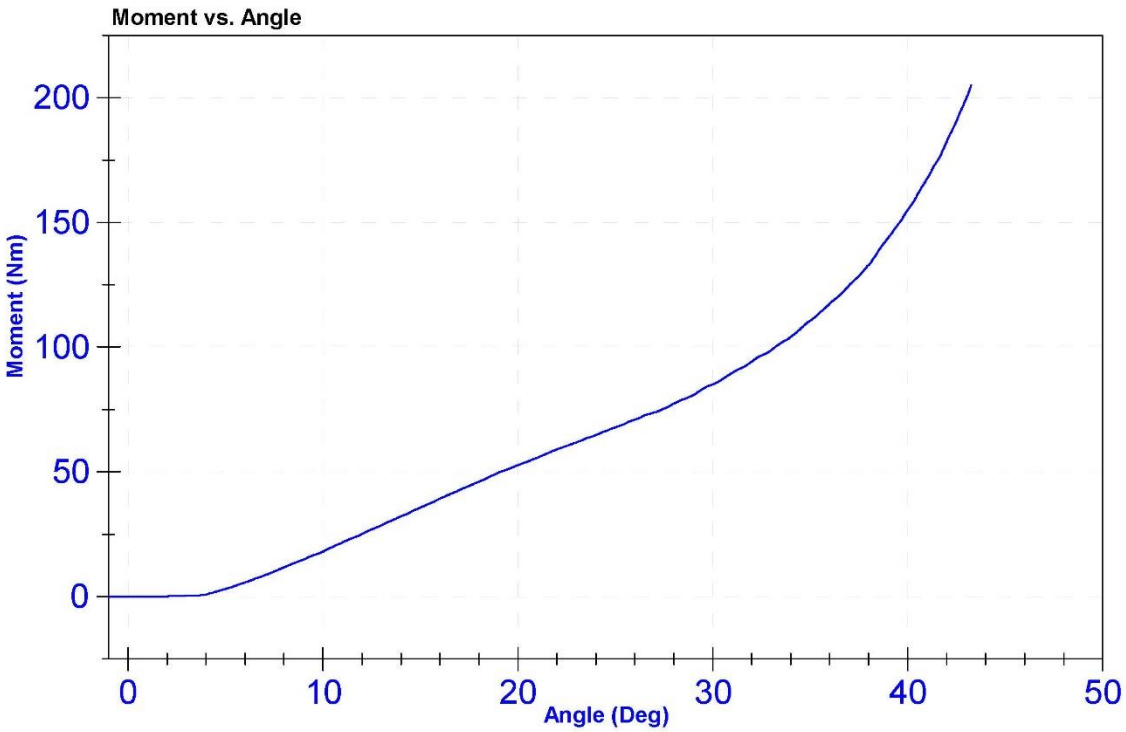
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	30.1	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	43.2	Pass
Moment at 30 degrees	0	94.9	Nm	85.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



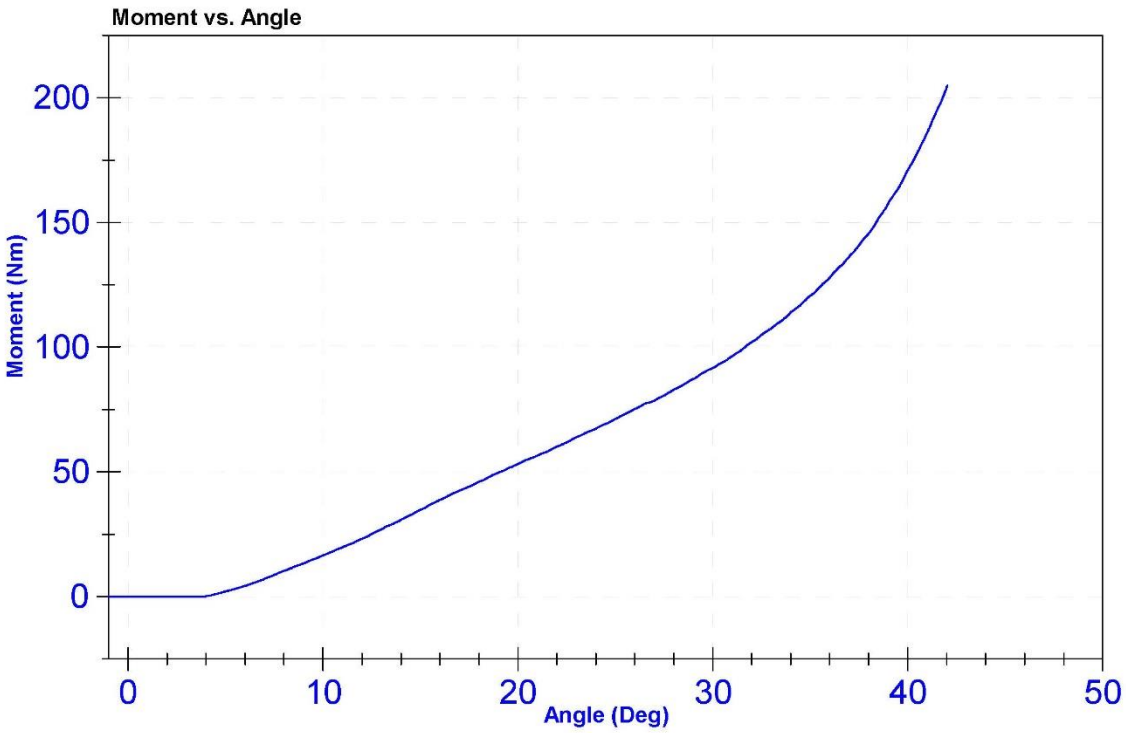
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	30.1	Pass
Average Velocity	5	10	deg/s	7.2	Pass
Angle at 203Nm	40	50	deg	41.9	Pass
Moment at 30 degrees	0	94.9	Nm	91.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



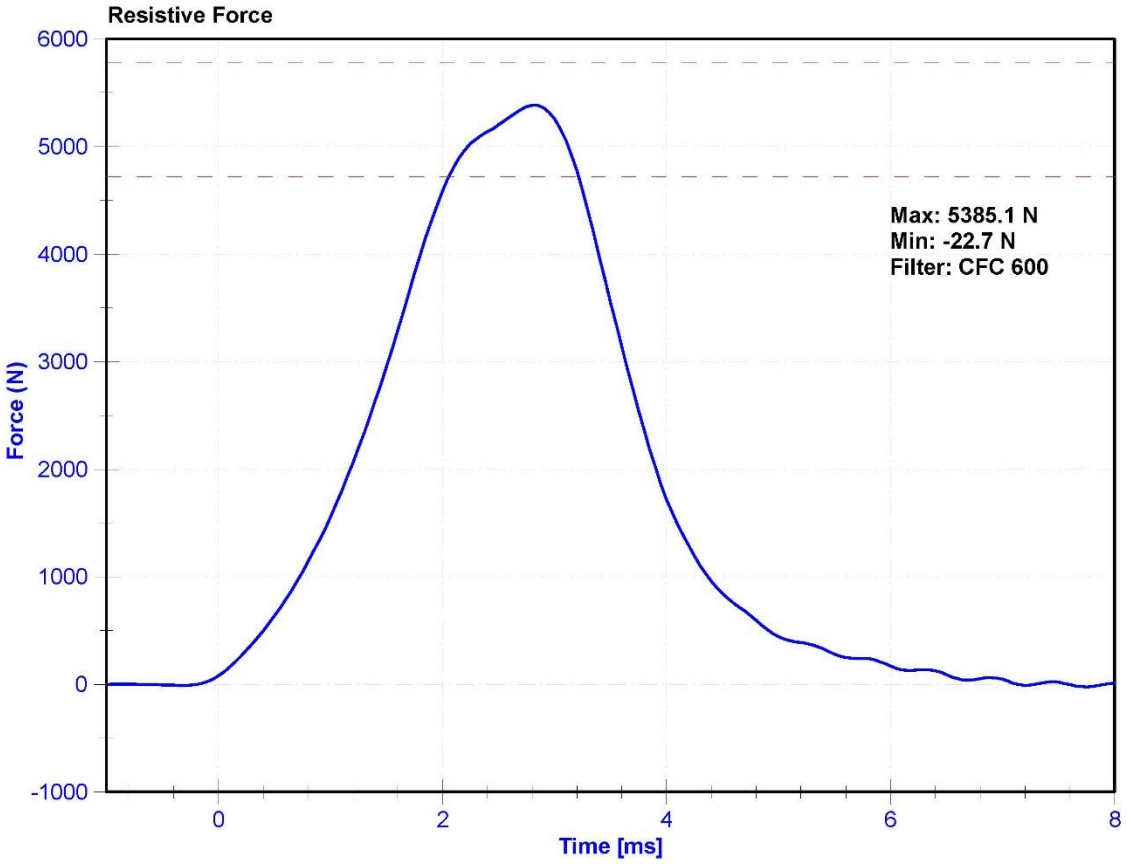
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

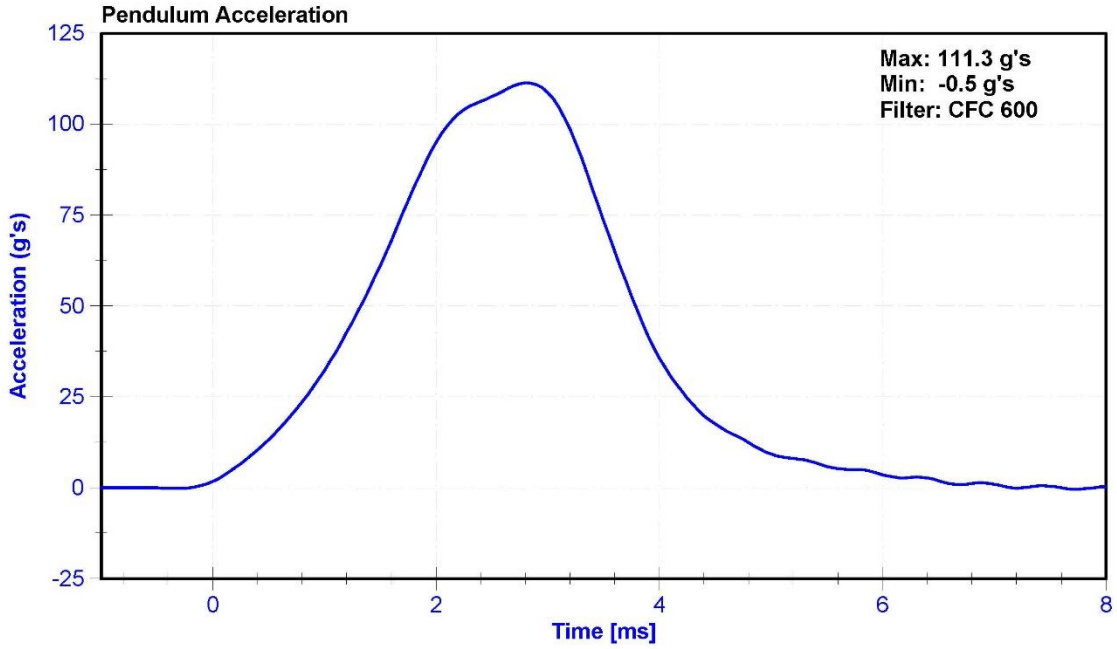
Results

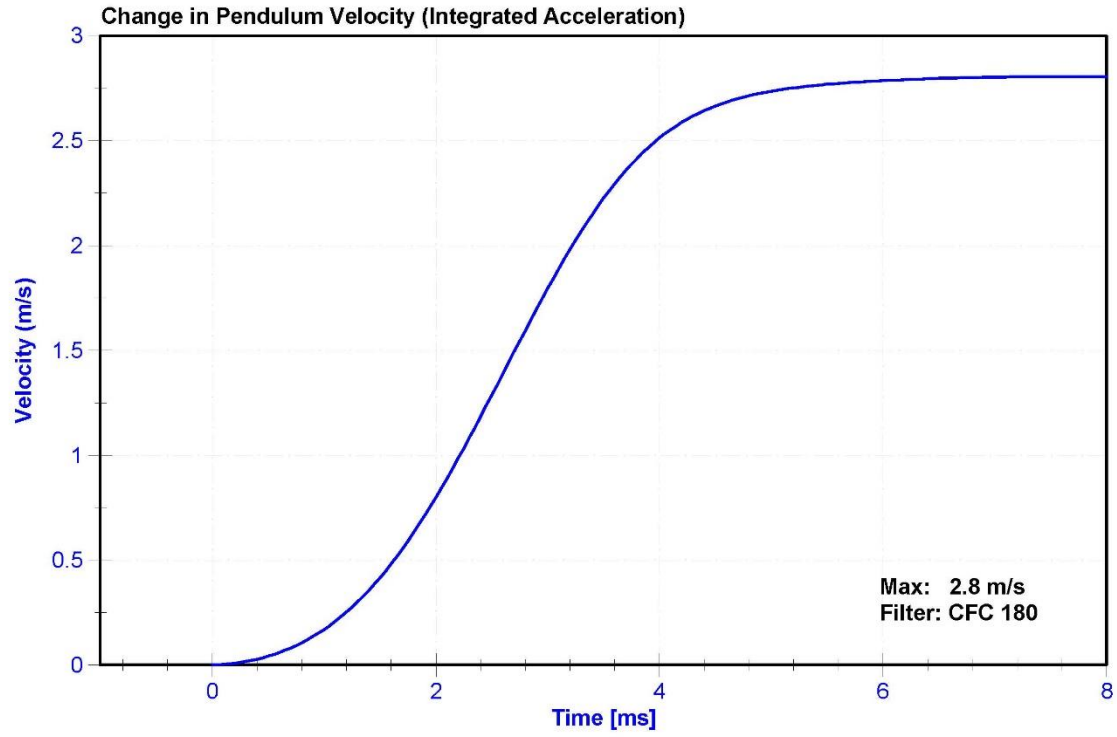
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.7	Pass
Humidity	10	70	%	25.6	Pass
Velocity	2.07	2.13	m/s	2.082	Pass
Maximum Resistive Force	4720	5780	N	5385.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Max: 111.3 g's
Min: -0.5 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.8 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

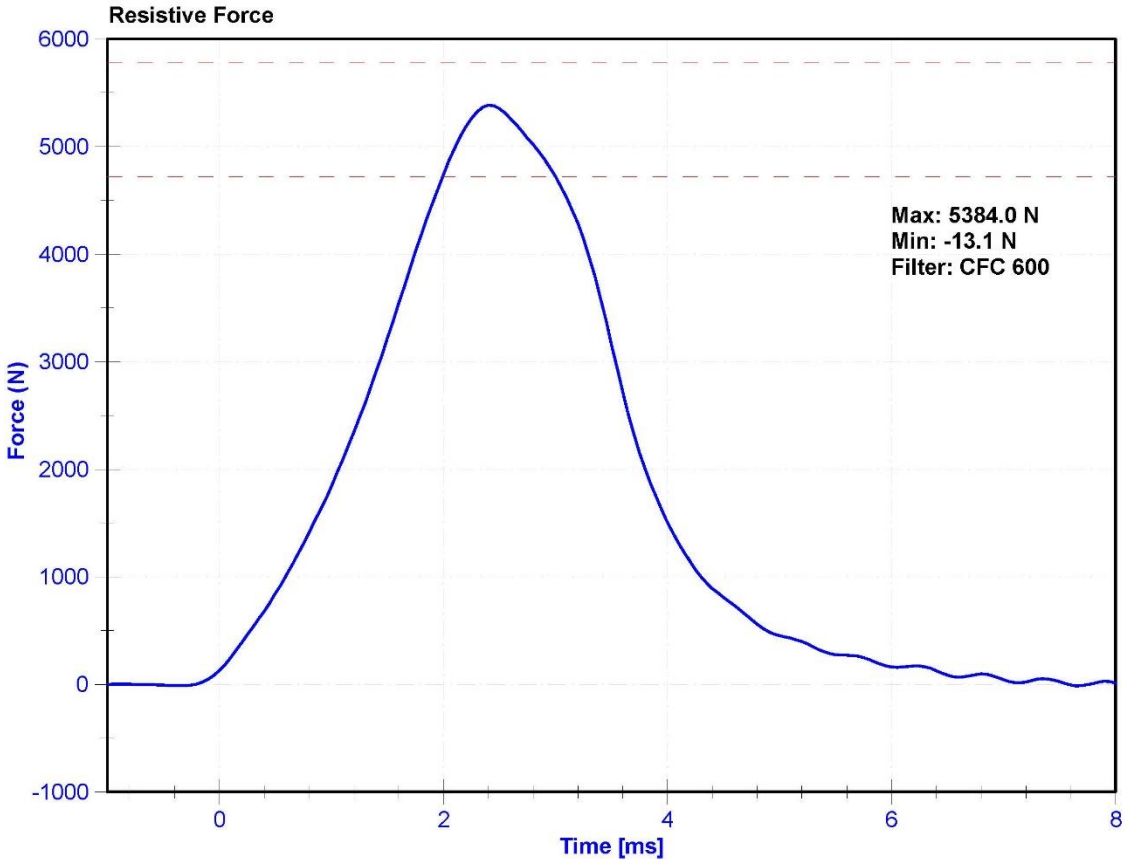
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

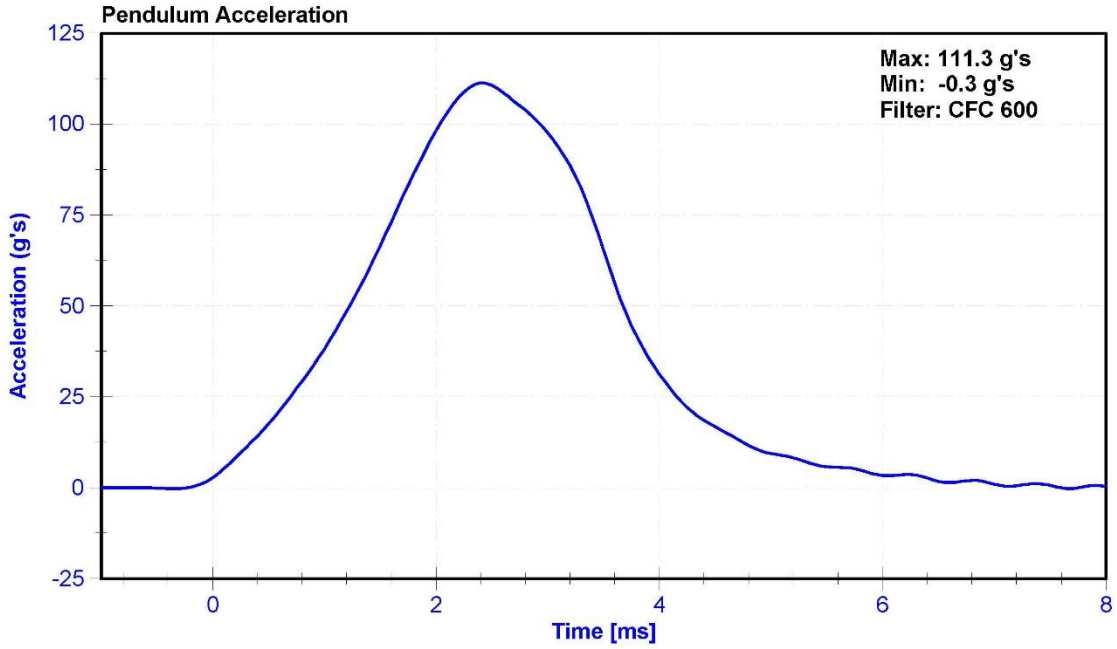
Results

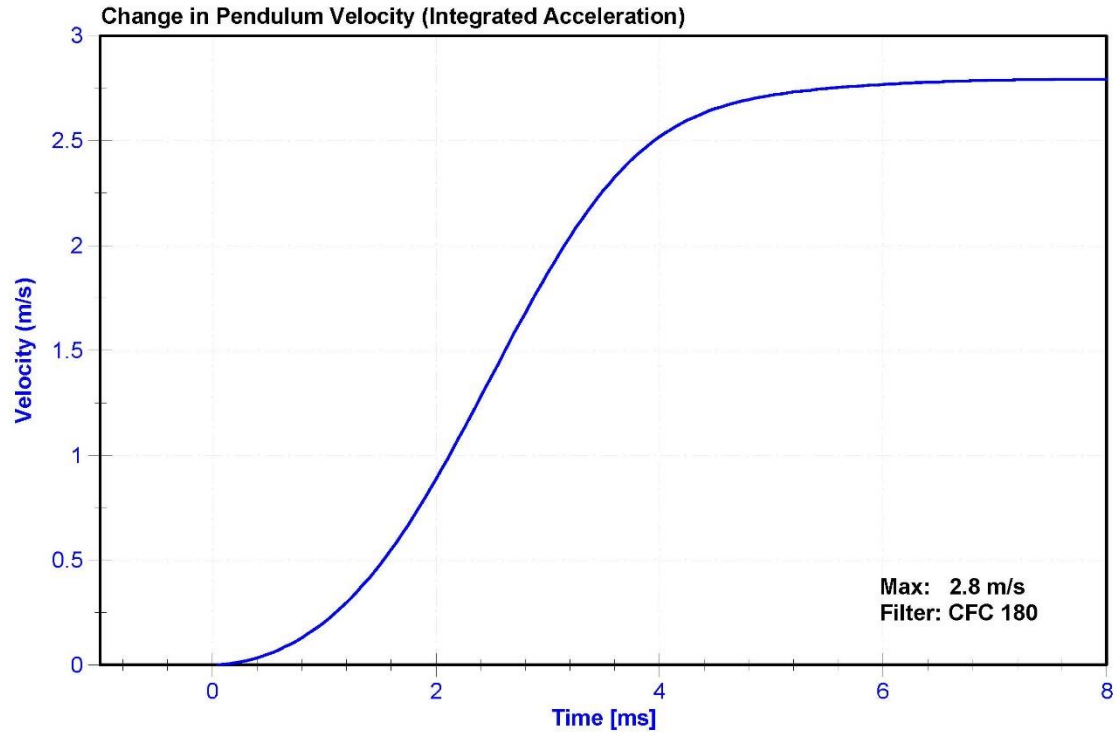
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.7	Pass
Humidity	10	70	%	25.6	Pass
Velocity	2.07	2.13	m/s	2.088	Pass
Maximum Resistive Force	4720	5780	N	5384.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Max: 111.3 g's
Min: -0.3 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.8 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

CALIBRATION TEST RESULTS

PRE-TEST

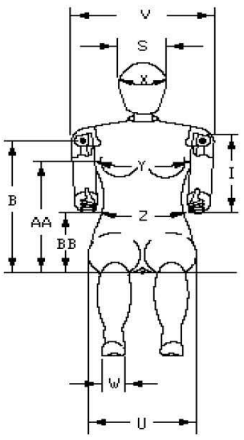
HYBRID III 5TH PERCENTILE - PASSENGER ATD

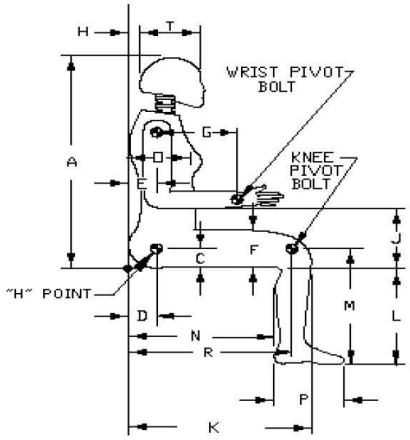
SERIAL NO: 288

External Measurements - Hybrid 3 - 5th Female

Technician: Steve Keller Date: 1/17/2017

Dummy Serial Number: 288





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	782	Pass
B	Shoulder Pivot Height	432	457	451	Pass
C	H-Point Height	81	86	86	Pass
D	H-Point from Backline	145	150	146	Pass
E	Shoulder Pivot from Backline	69	84	72	Pass
F	Thigh Clearance	119	135	124	Pass
G	Back of Elbow to Wrist Pivot	244	259	248	Pass
H	Head Back to Backline	43	48	46	Pass
I	Shoulder to Elbow Length	277	297	290	Pass
J	Elbow Rest Height	183	203	189	Pass
K	Buttock to Knee Length	521	546	531	Pass
L	Popliteal Height	356	376	365	Pass
M	Knee Pivot Height	394	419	398	Pass
N	Buttock Popliteal Length	414	439	430	Pass
O	Chest Depth without Jacket	175	191	183	Pass
P	Foot Length (right)	219	234	220	Pass
R	Buttock To Knee Pivot Length	457	483	463	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	180	Pass
U	Hip Breadth	300	315	310	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	84	Pass
X	Head Circumference	528	549	538	Pass
Y	Chest Circumference with Jacket	851	881	854	Pass
Z	Waist Circumference	460	790	776	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

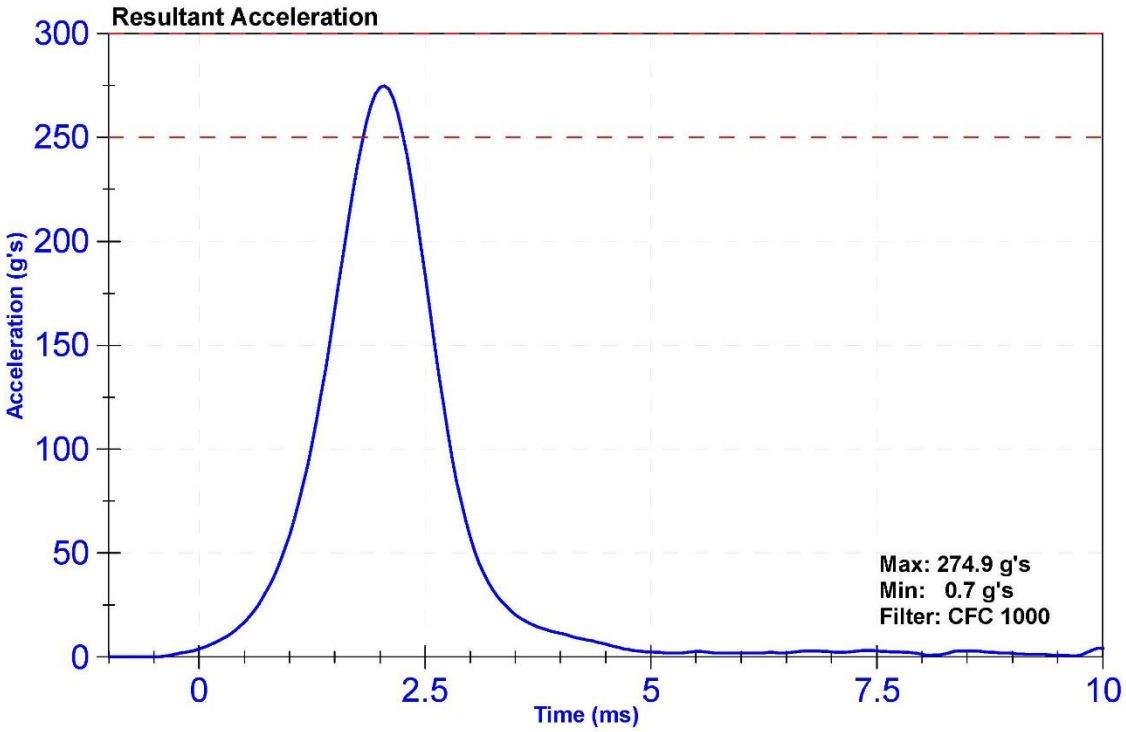
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

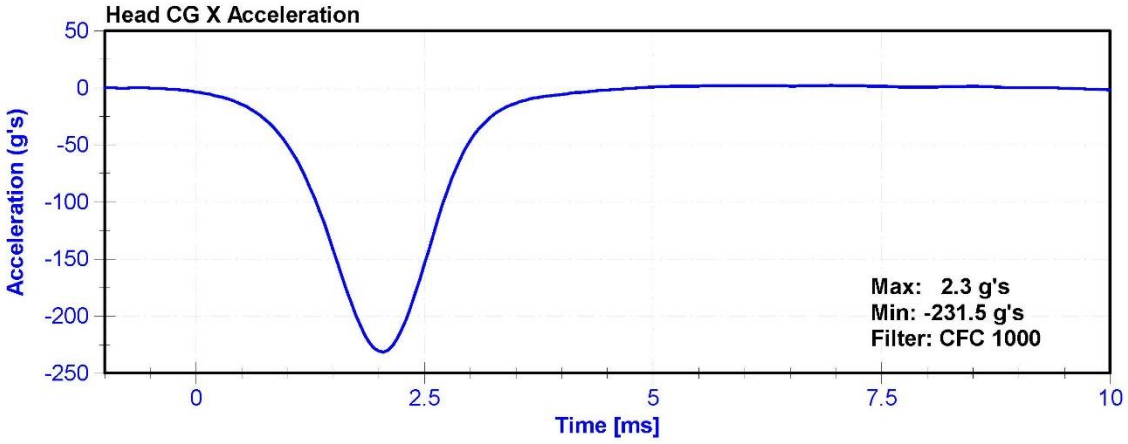
Results

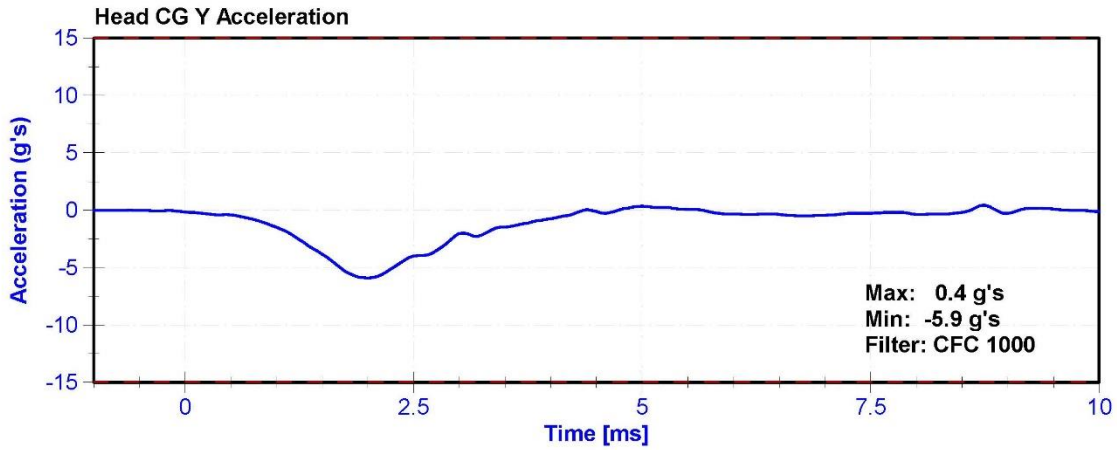
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Resultant Acceleration	250	300	g's	274.9	Pass
Oscillation	0	10	%	1.5	Pass
Lateral Acceleration	-15	15	g's	-5.9	Pass

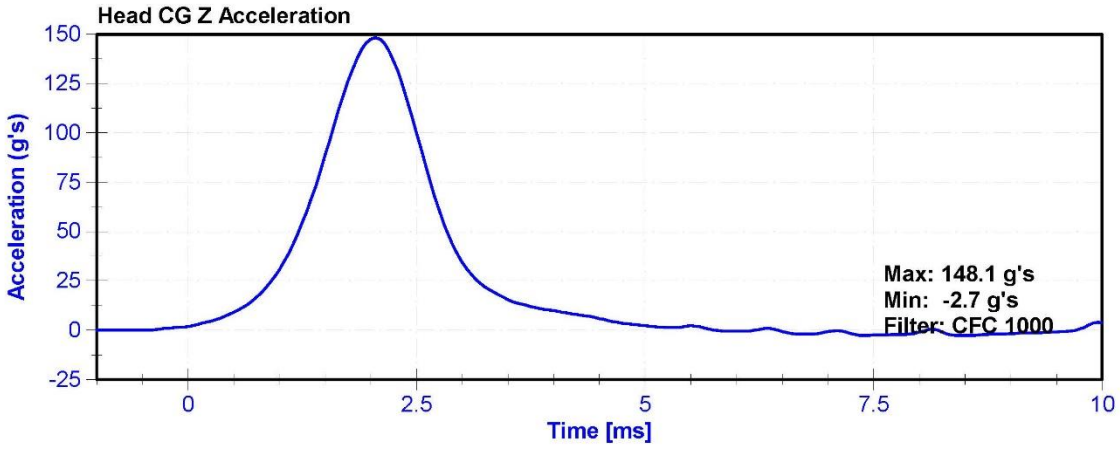
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P80337	10/3/2016	4/3/2017
Y Accelerometer	ENDEVCO 7264	AC-P80265	10/3/2016	4/3/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	10/3/2016	4/3/2017




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 2.3 g's
Min: -231.5 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 0.4 g's
Min: -5.9 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 148.1 g's
Min: -2.7 g's
Filter: CFC 1000

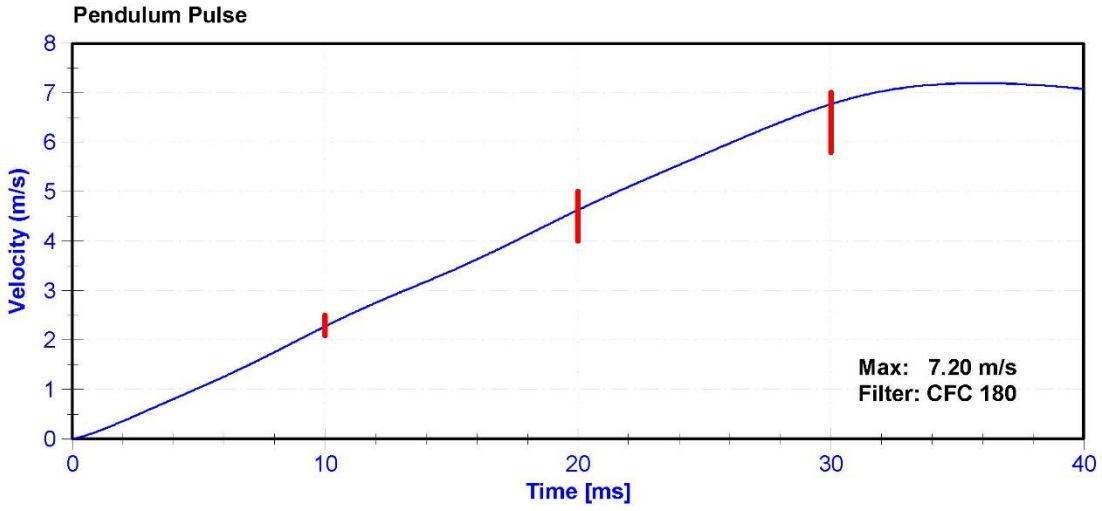
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

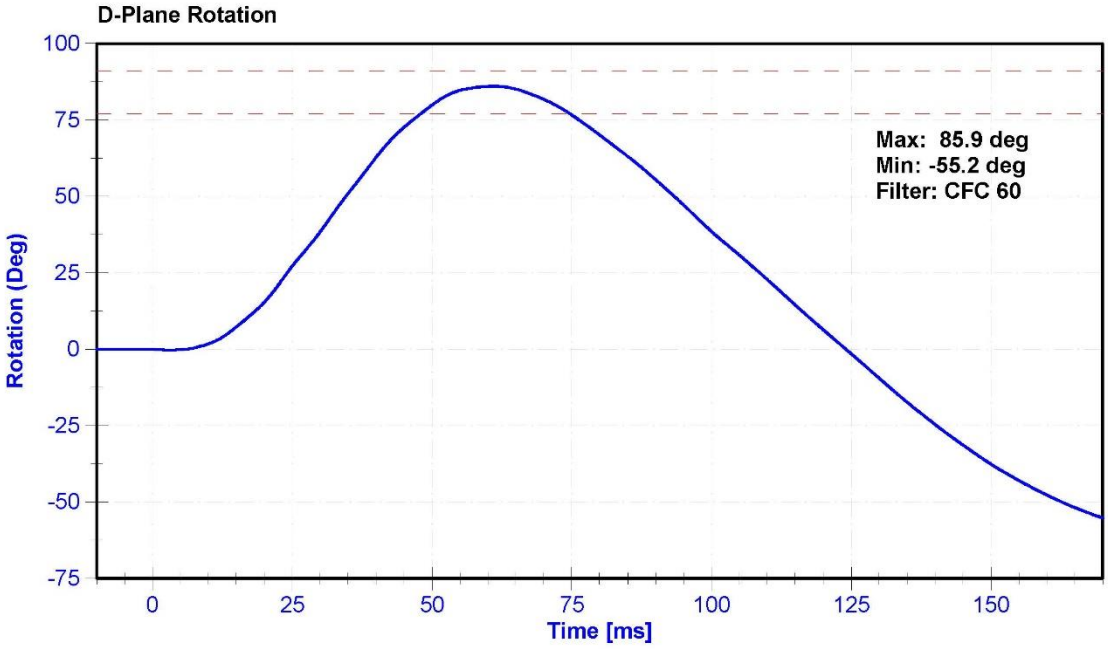
Results

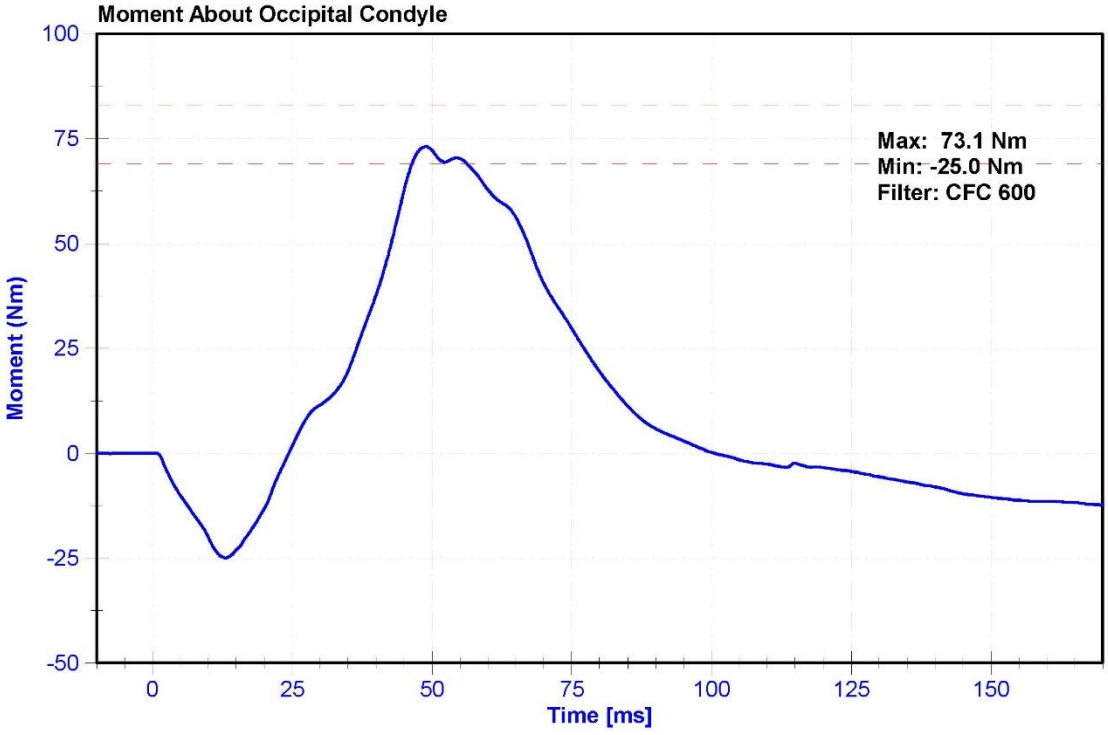
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	25.1	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.28	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.63	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.77	Pass
Max D Plane Rotation	77	91	deg	85.9	Pass
Max Moment During Rotation Interval	69	83	Nm	73.1	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.0	Pass

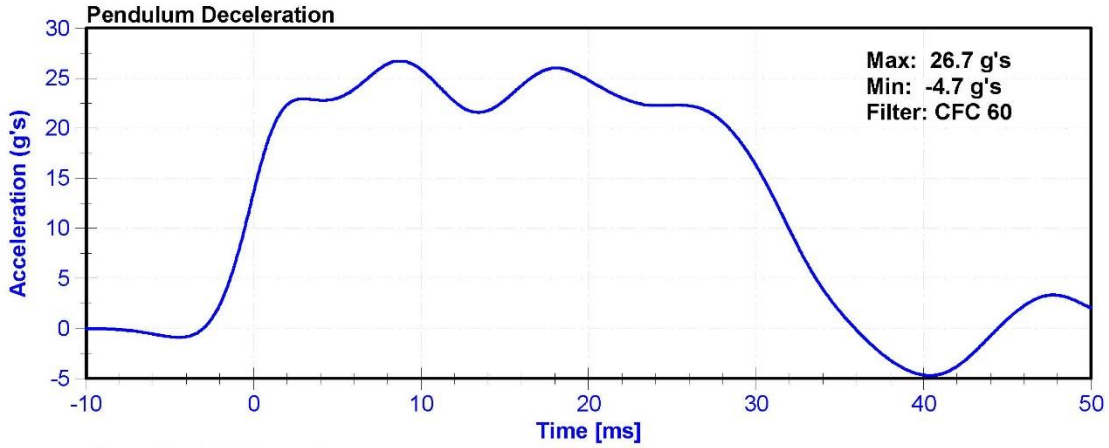
Transducer Calibrations

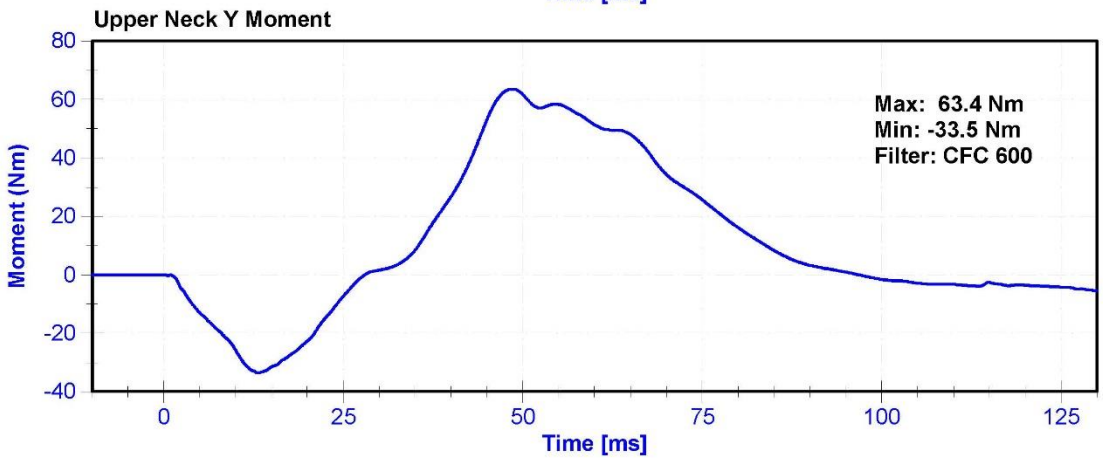
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017

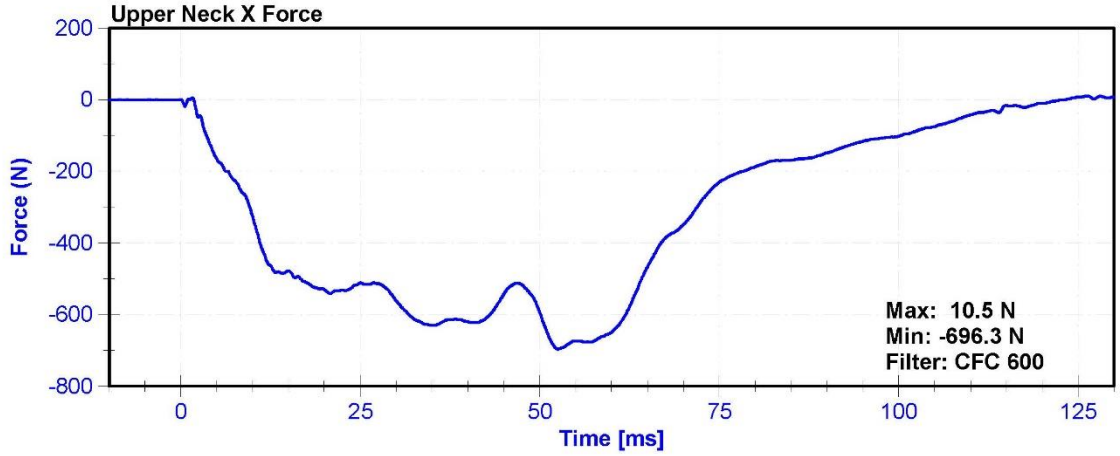



D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 85.9 deg
Min: -55.2 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 73.1 Nm
Min: -25.0 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 26.7 g's
Min: -4.7 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 63.4 Nm
Min: -33.5 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 10.5 N
Min: -696.3 N
Filter: CFC 600
Force (N)
Time [ms]

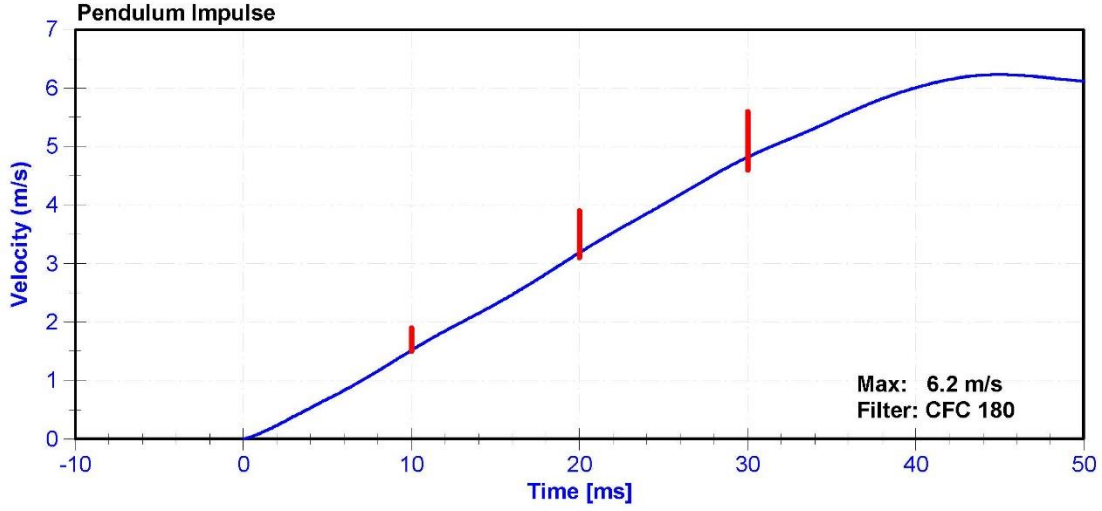
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

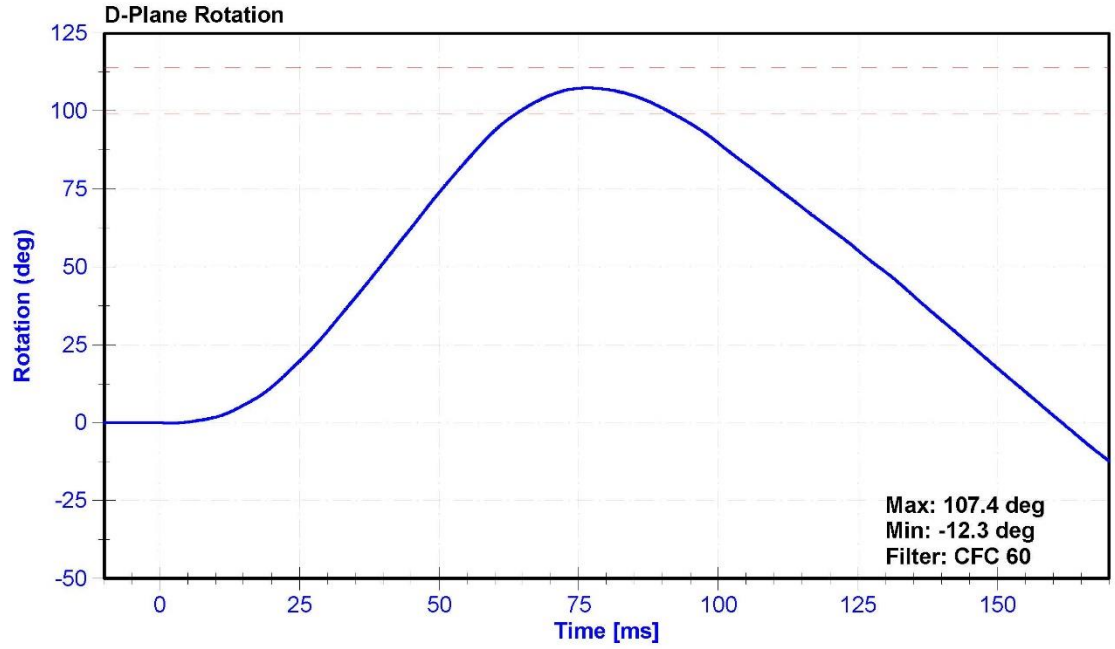
Results

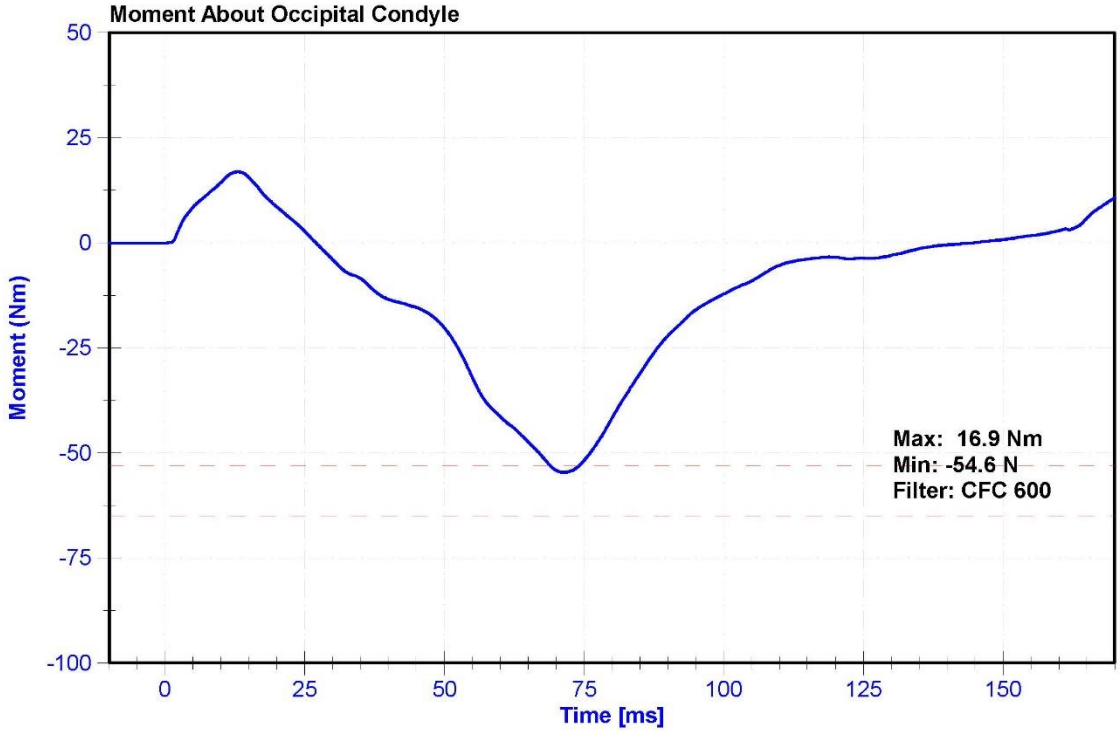
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	25.2	Pass
Velocity	5.95	6.19	m/s	6.025	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.52	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.19	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	4.82	Pass
D Plane Rotation	99	114	deg	107.4	Pass
Moment During Rotation Interval	-65	-53	Nm	-54.6	Pass
Moment Decay to -10Nm	94	114	ms	103.4	Pass

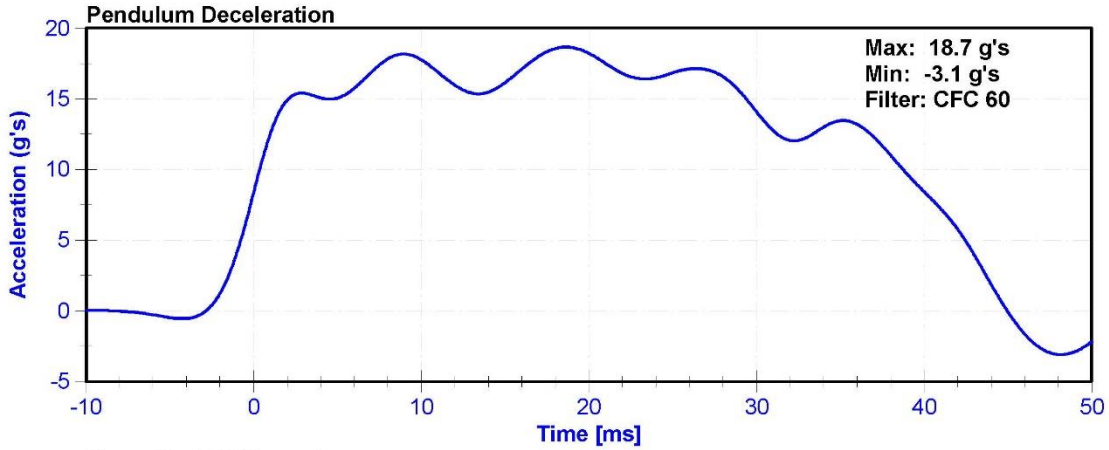
Transducer Calibrations

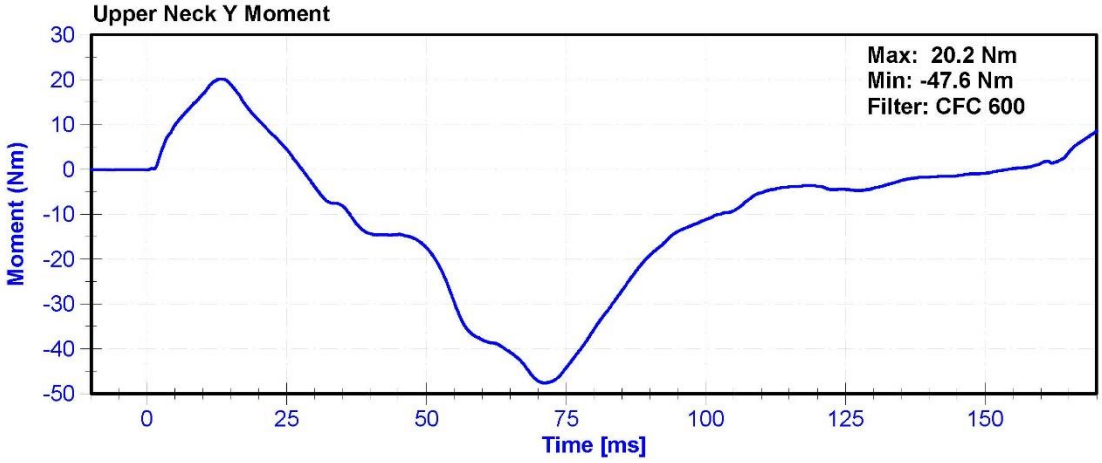
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017

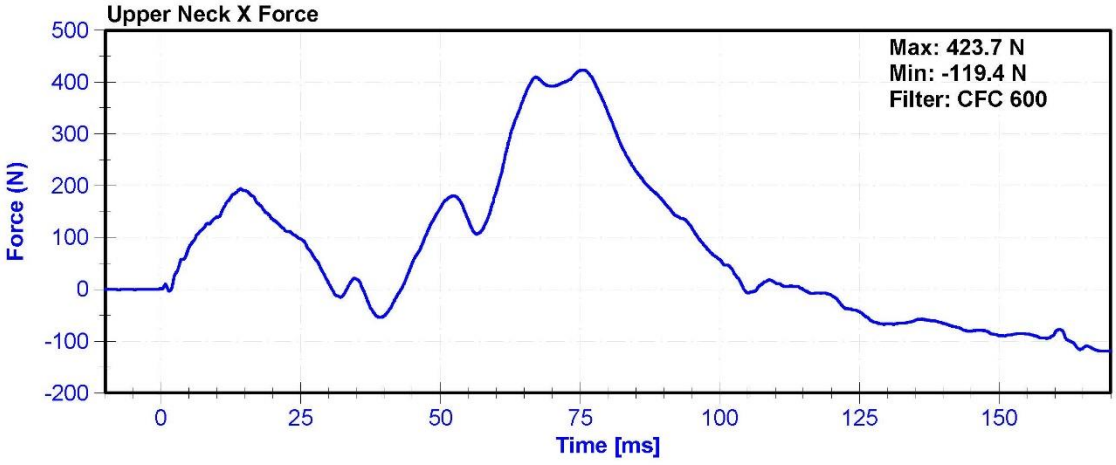



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 107.4 deg
Min: -12.3 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 16.9 Nm
Min: -54.6 N
Filter: CFC 600


Pendulum Deceleration
Max: 18.7 g's
Min: -3.1 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 20.2 Nm
Min: -47.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 423.7 N
Min: -119.4 N
Filter: CFC 600
Force (N)
Time [ms]

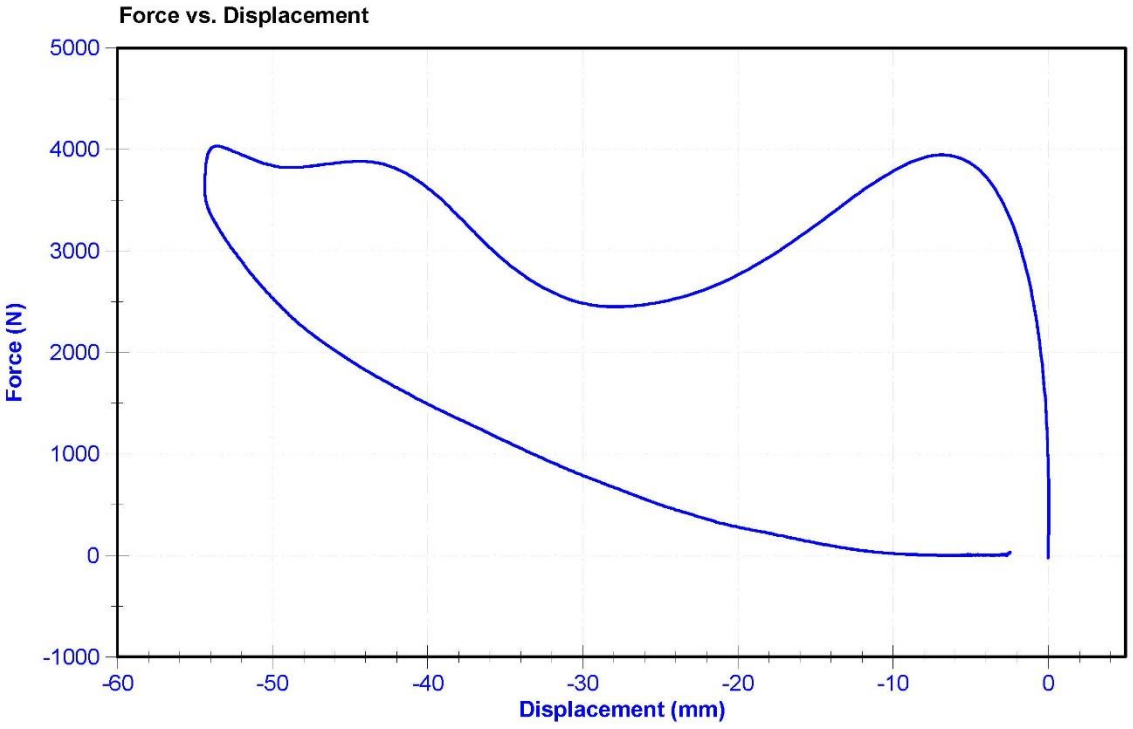
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

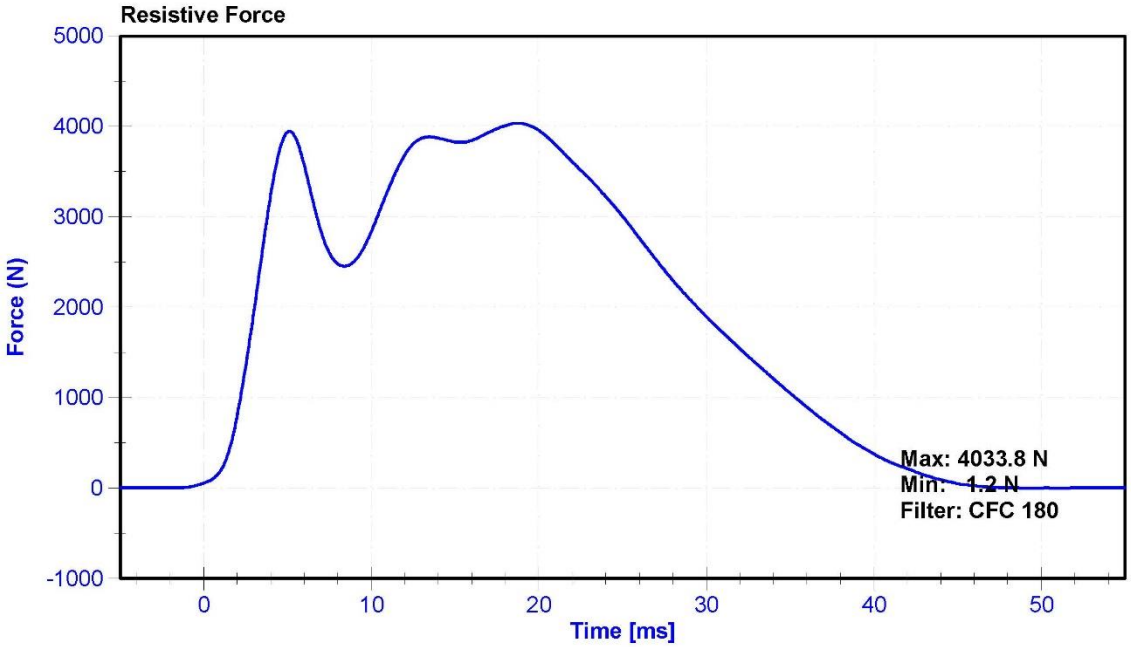
Results

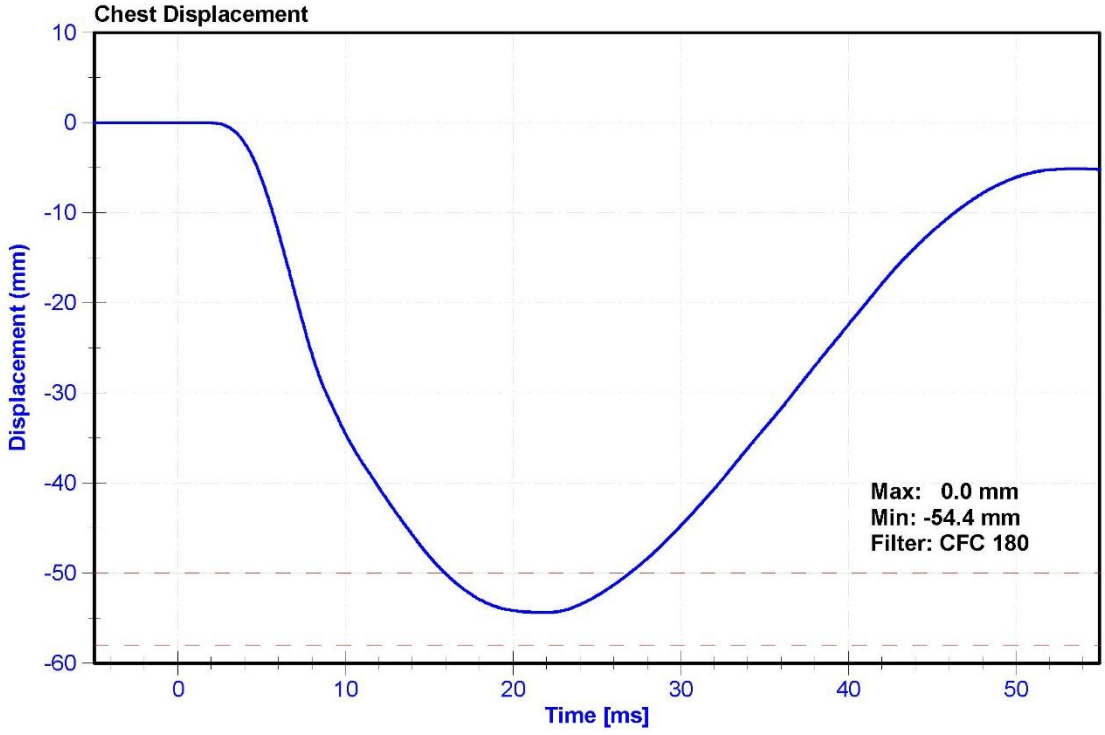
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	26	Pass
Velocity	6.59	6.83	m/s	6.699	Pass
Chest Deflection	-58	-50	mm	-54.4	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4033.8	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	3883.9	Pass
Hysteresis	69	85	%	71.8	Pass

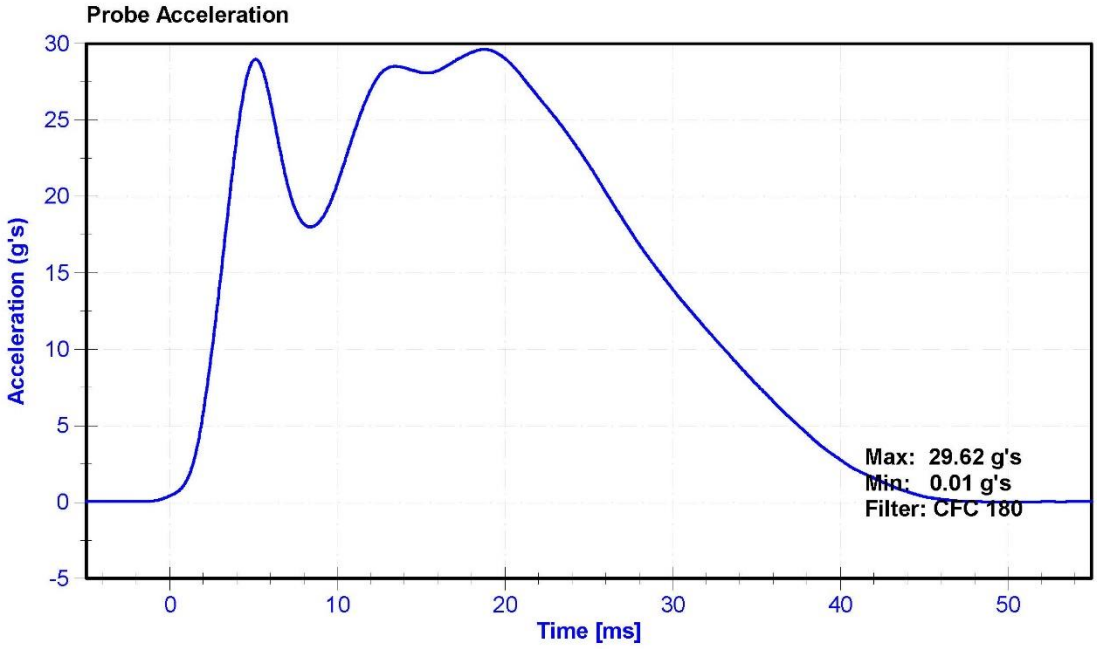
Transducer Calibrations

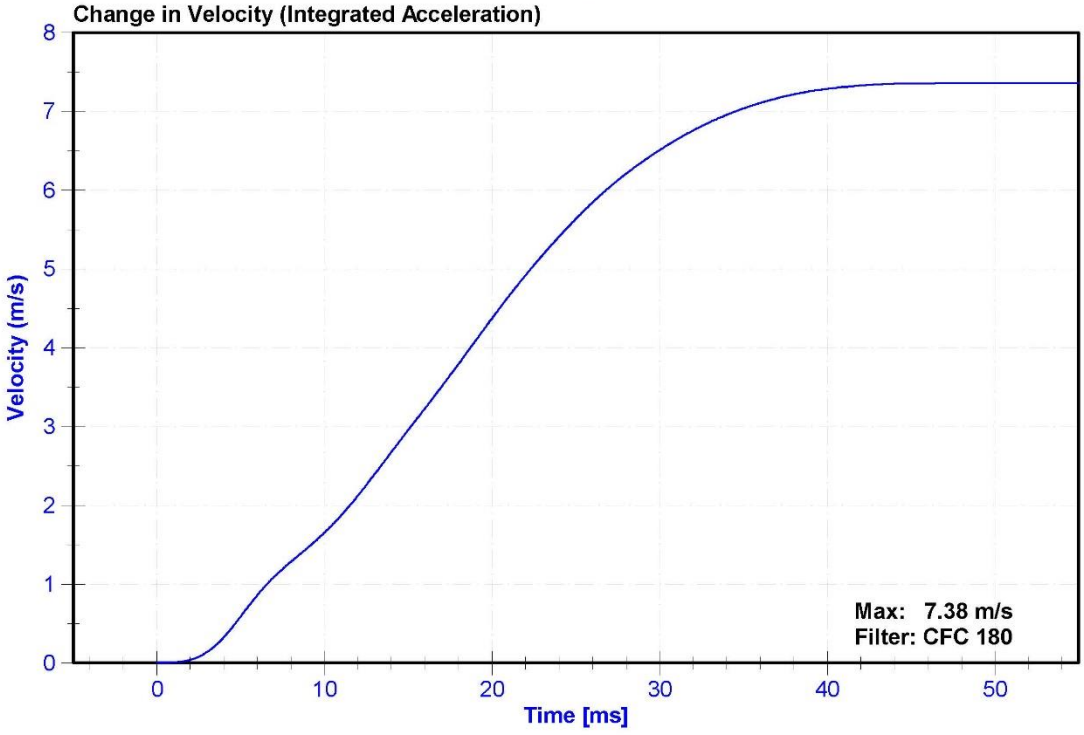
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	SERVO 14CB1-2897	DS-288	9/30/2016	9/30/2017




Resistive Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4033.8 N
Min: -1.2 N
Filter: CFC 180


Chest Displacement
Displacement (mm)
10
0
-10
-20
-30
-40
-50
-60
0
10
20
30
40
50
Time [ms]
Max: 0.0 mm
Min: -54.4 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]
Max: 29.62 g's
Min: 0.01 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]
Max: 7.38 m/s
Filter: CFC 180

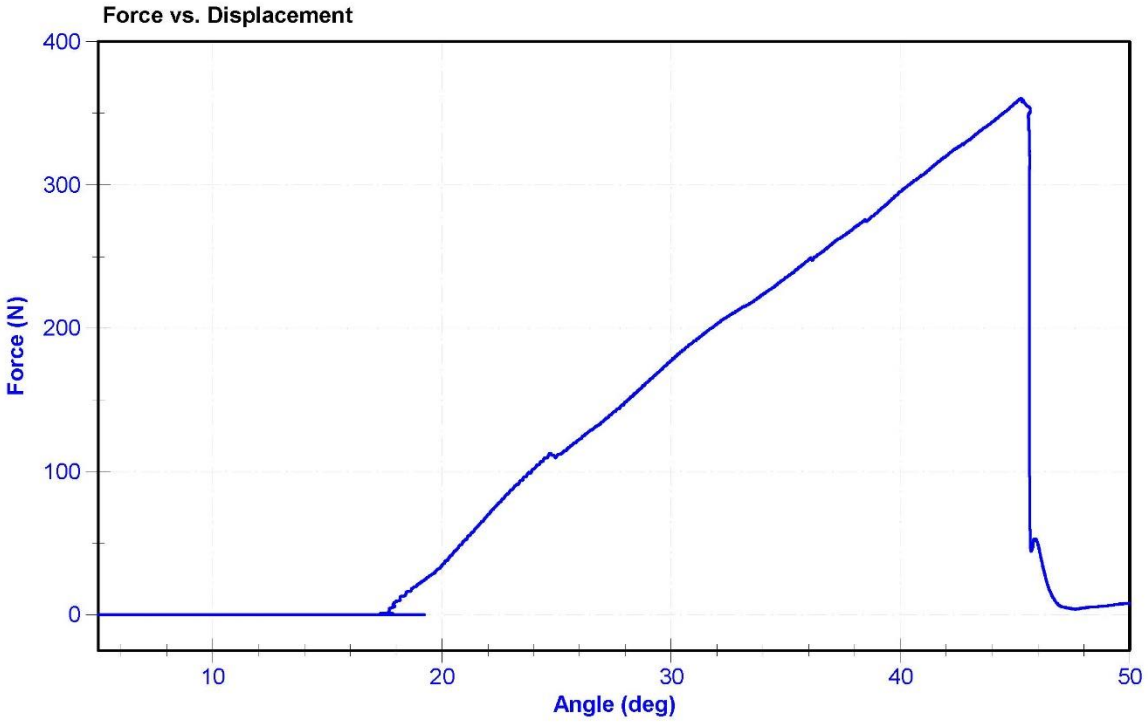
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	20.9	Pass
Humidity	10	70	%	28.3	Pass
Initial Angle	0	20	deg	17.5	Pass
Force at 45 Degrees	320	390	N	360.7	Pass
Return Angle Relative to Initial	0	8	deg	6.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	9/7/2016	9/7/2017
Load Cell	Interface SML-200	LC-493319	9/7/2016	9/7/2017



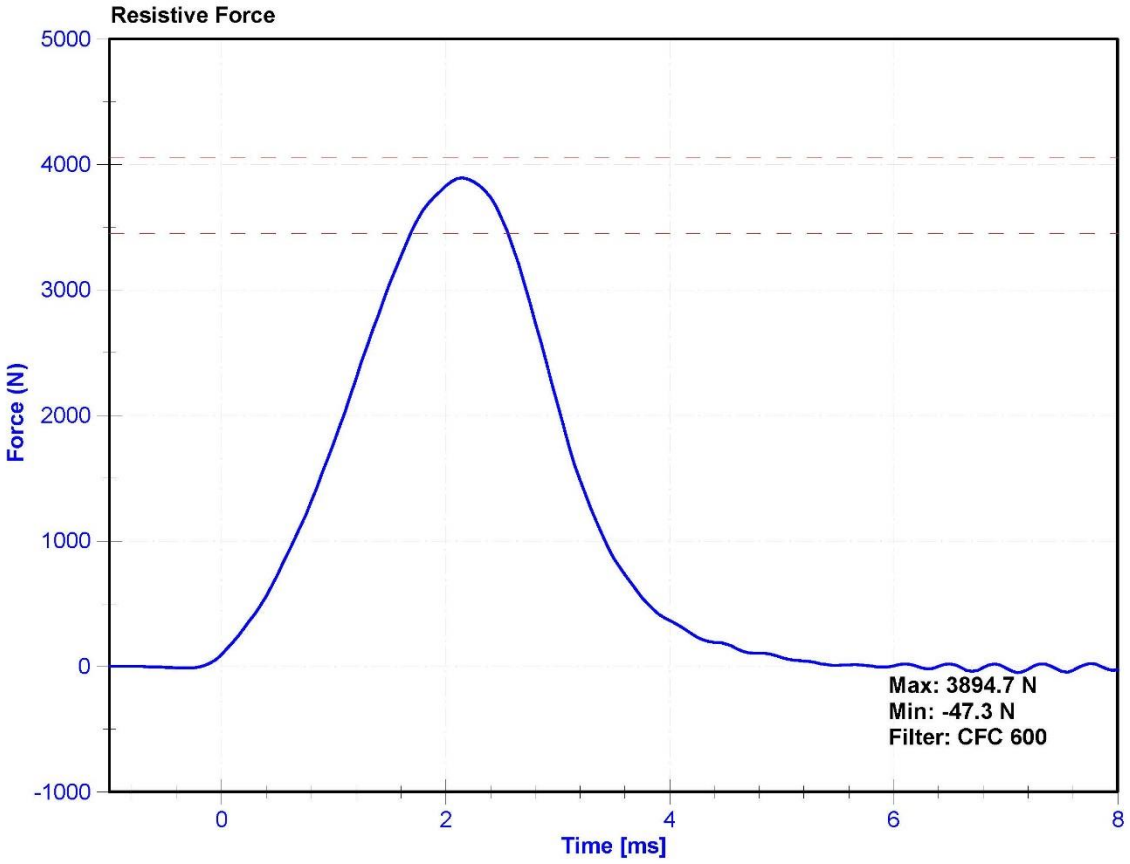
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

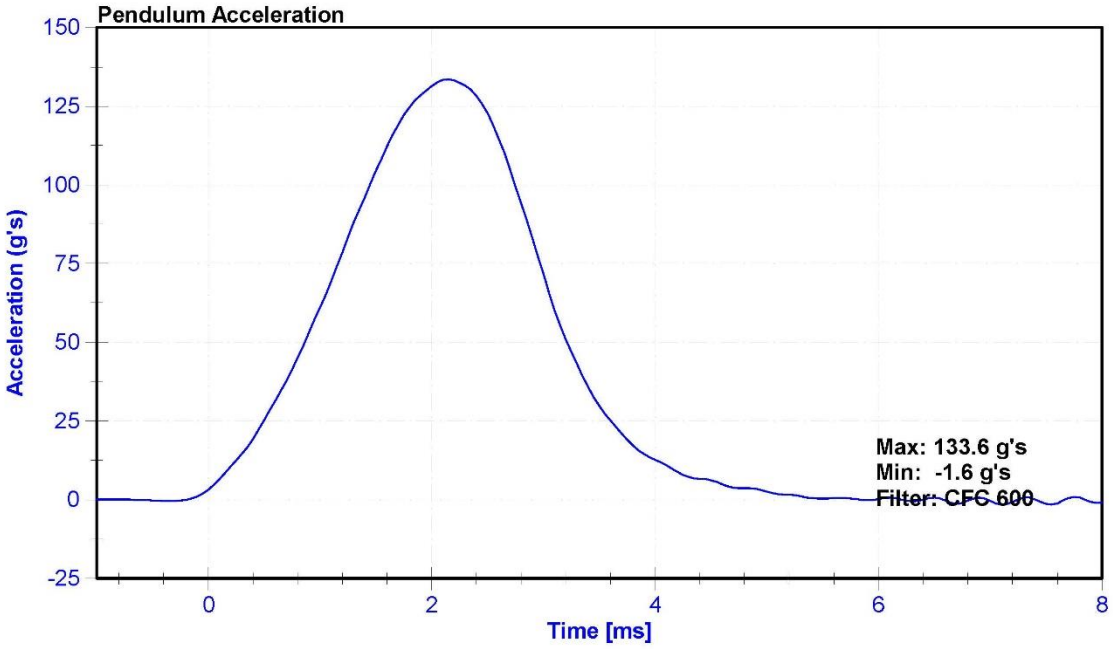
Results

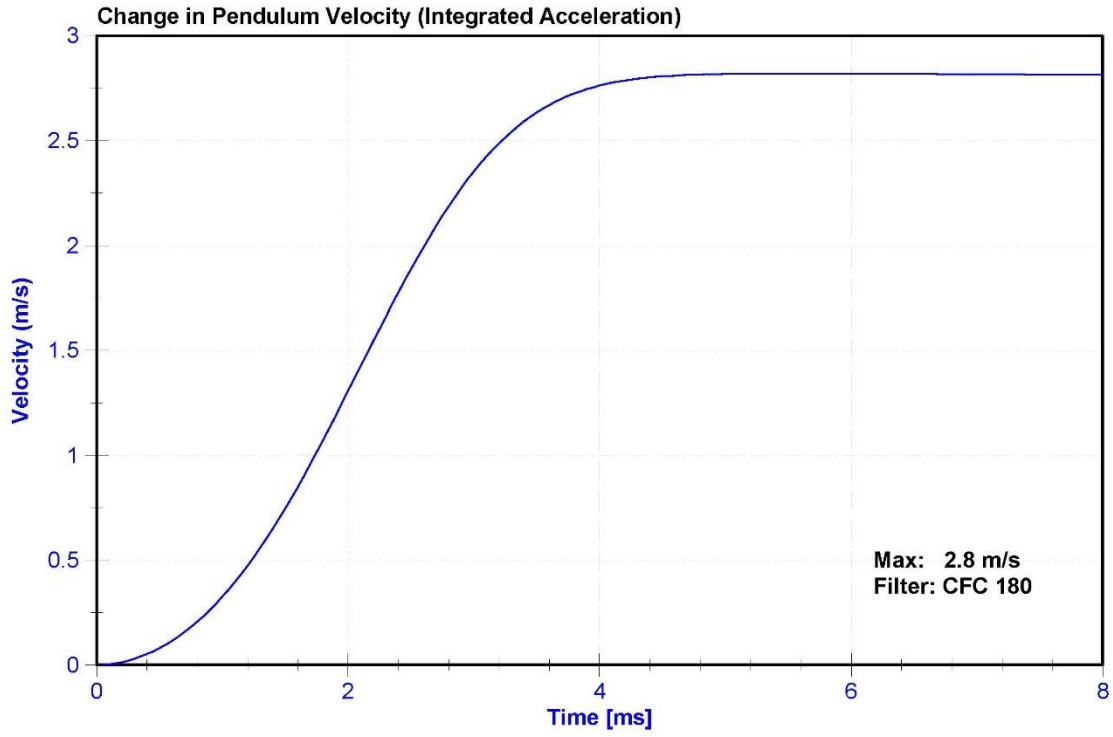
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	25.6	Pass
Velocity	2.07	2.13	m/s	2.081	Pass
Resistive Force	3450	4060	N	3894.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 133.6 g's
Min: -1.6 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180

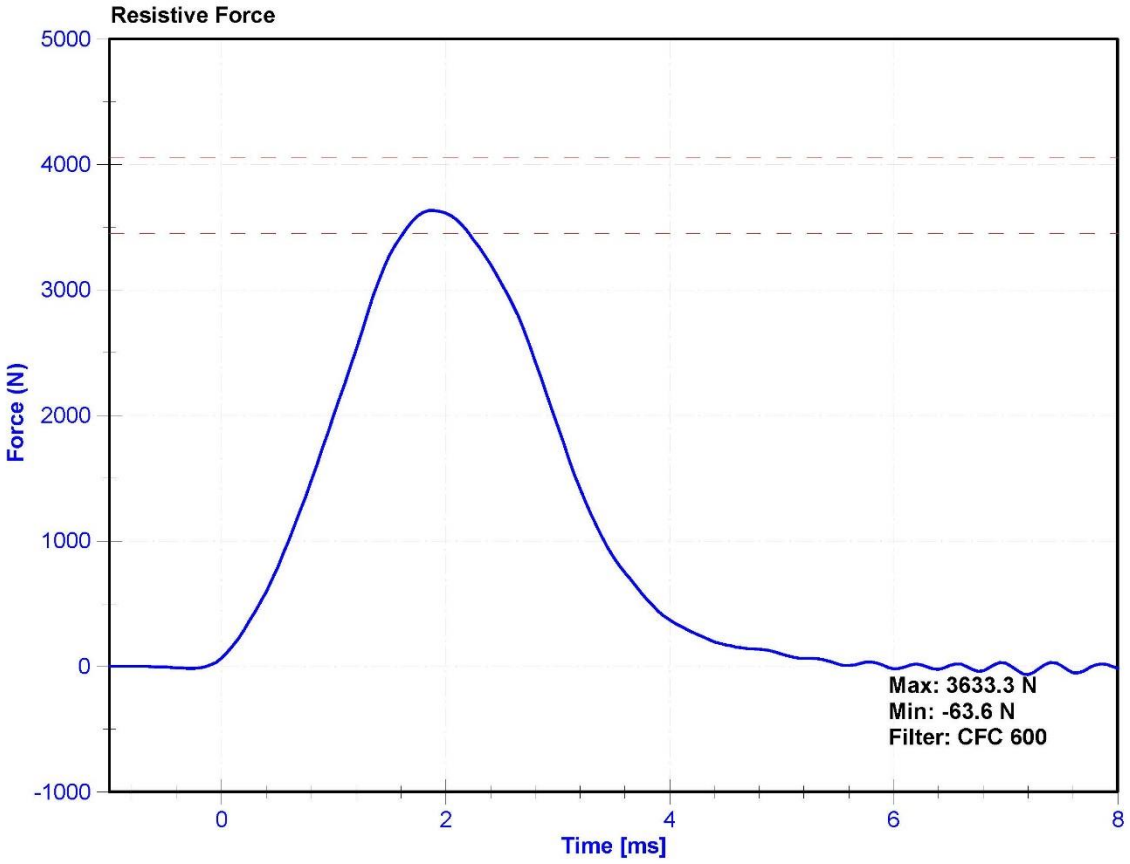
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

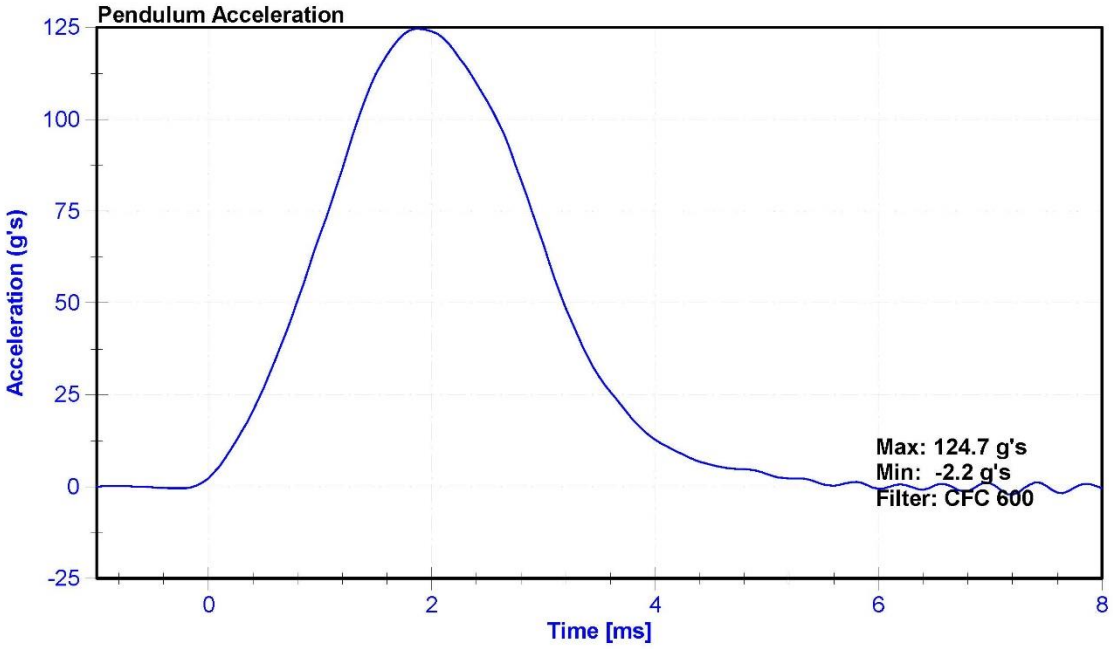
Results

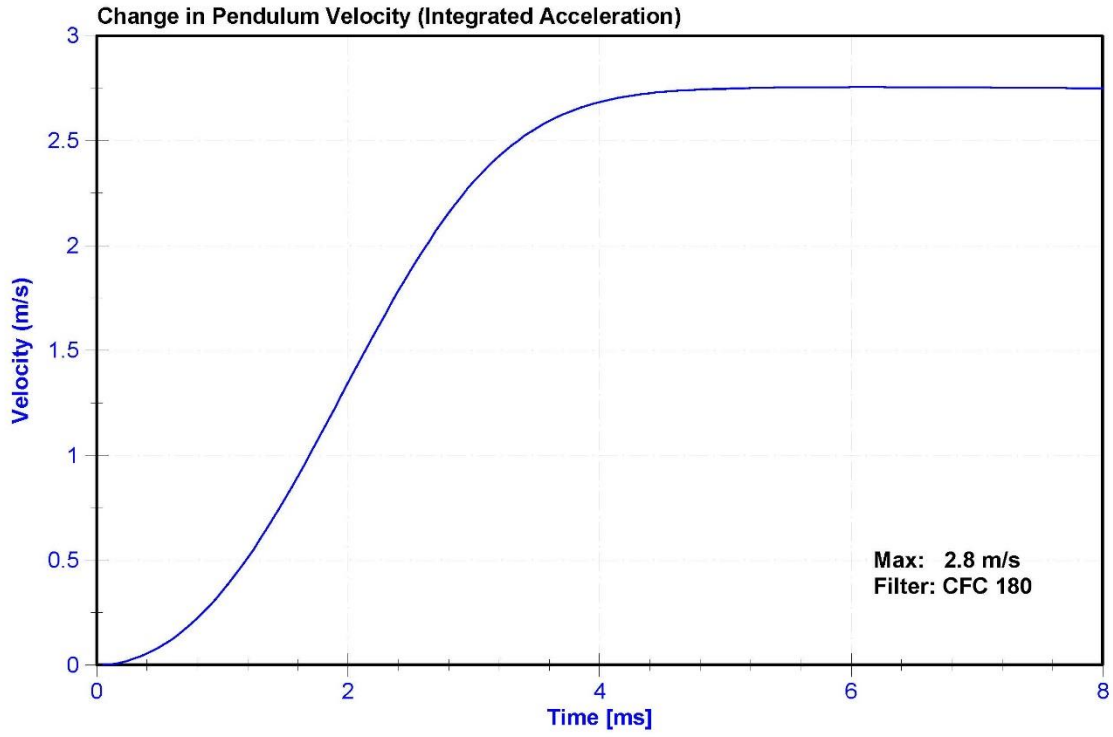
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	25.6	Pass
Velocity	2.07	2.13	m/s	2.081	Pass
Resistive Force	3450	4060	N	3633.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 124.7 g's
Min: -2.2 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180

CALIBRATION TEST RESULTS

POST-TEST

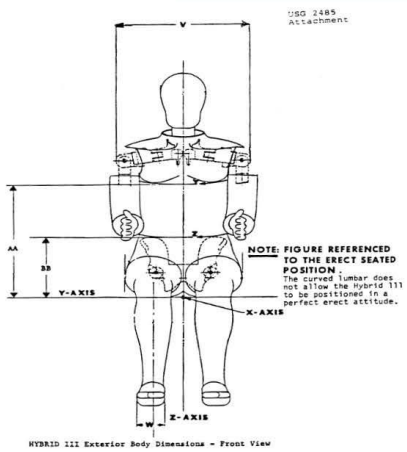
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046

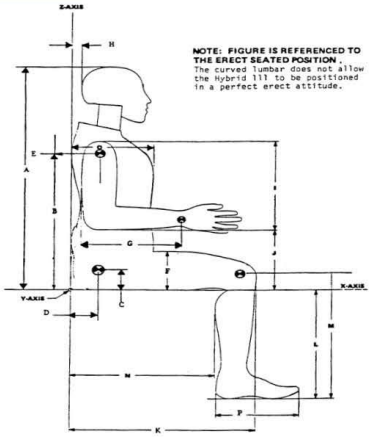
External Measurements - Hybrid 3 - 50th Male

Technician: M.Hartung Date: 3/1/2017

Dummy Serial Number: 1046



HYBRID III Exterior Body Dimensions - Front View



HYBRID III Exterior Body Dimensions - Side View

Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.7	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.3	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	5.8	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	12.0	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.5	Pass
J	Elbow Rest Height	7.5	8.3	8.1	Pass
K	Buttock to Knee Length	22.8	23.8	23.2	Pass
L	Popliteal Height	16.9	17.9	17.5	Pass
M	Knee Pivot Height	19.1	19.7	19.4	Pass
N	Buttock Popliteal Length	17.8	18.8	18.2	Pass
O	Chest Depth without Jacket	8.4	9.0	8.8	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	16.8	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.7	Pass
Z	Waist Circumference	32.9	34.1	33.3	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

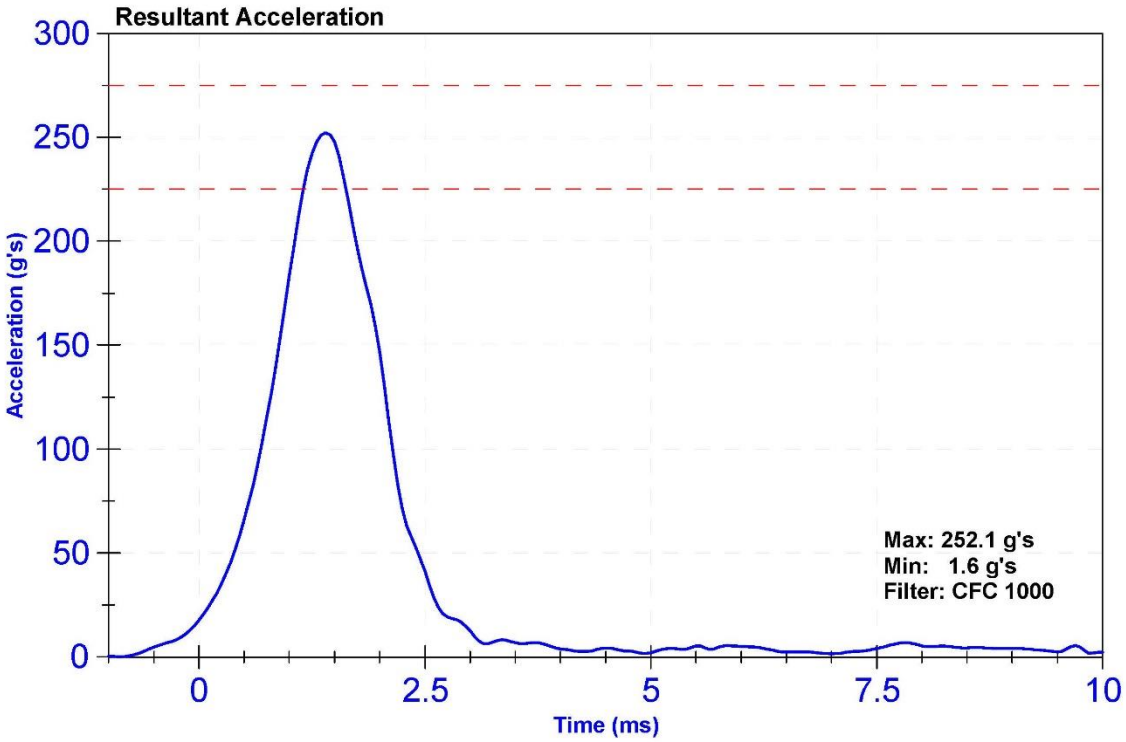
ATD Manufacturer	FTSS	Test Technician	M. Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

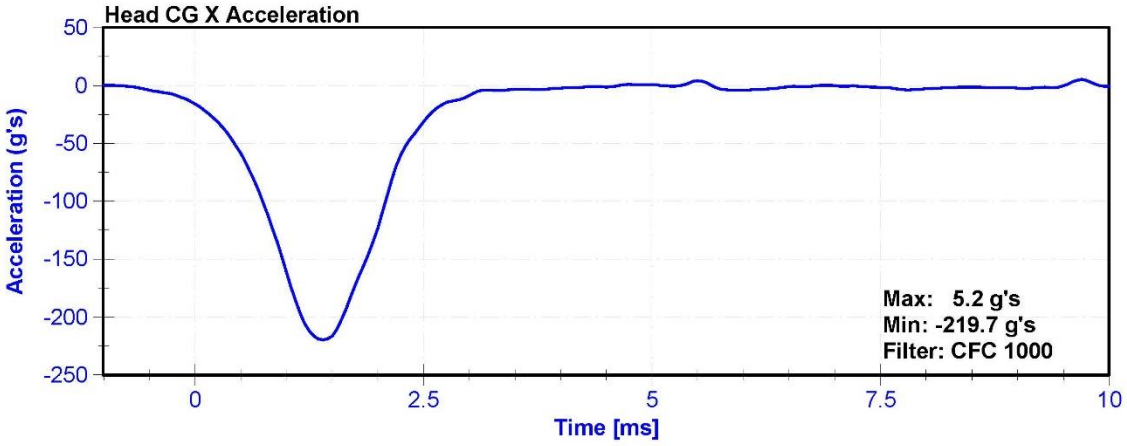
Results

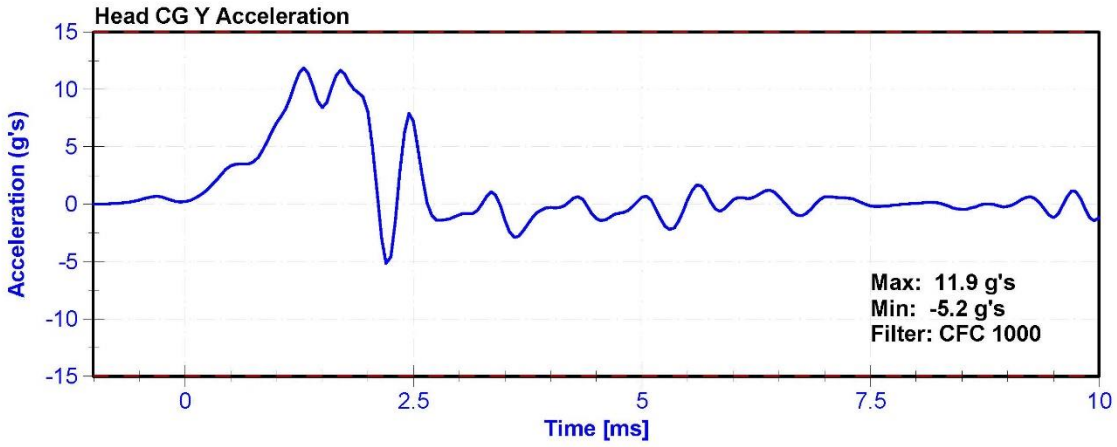
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.3	Pass
Humidity	10	70	%	51.3	Pass
Resultant Acceleration	225	275	g's	252.1	Pass
Oscillation	0	10	%	5.8	Pass
Lateral Acceleration	-15	15	g's	11.9	Pass

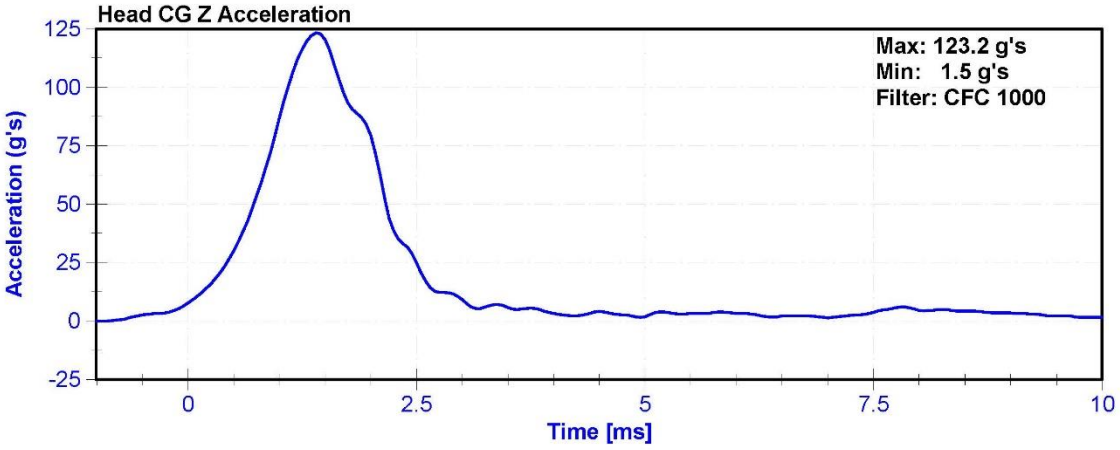
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58871	9/19/2016	3/20/2017
Y Accelerometer	ENDEVCO 7264	AC-P12359	9/19/2016	3/20/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P52133	9/19/2016	3/20/2017




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 5.2 g's
Min: -219.7 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 11.9 g's
Min: -5.2 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 123.2 g's
Min: 1.5 g's
Filter: CFC 1000

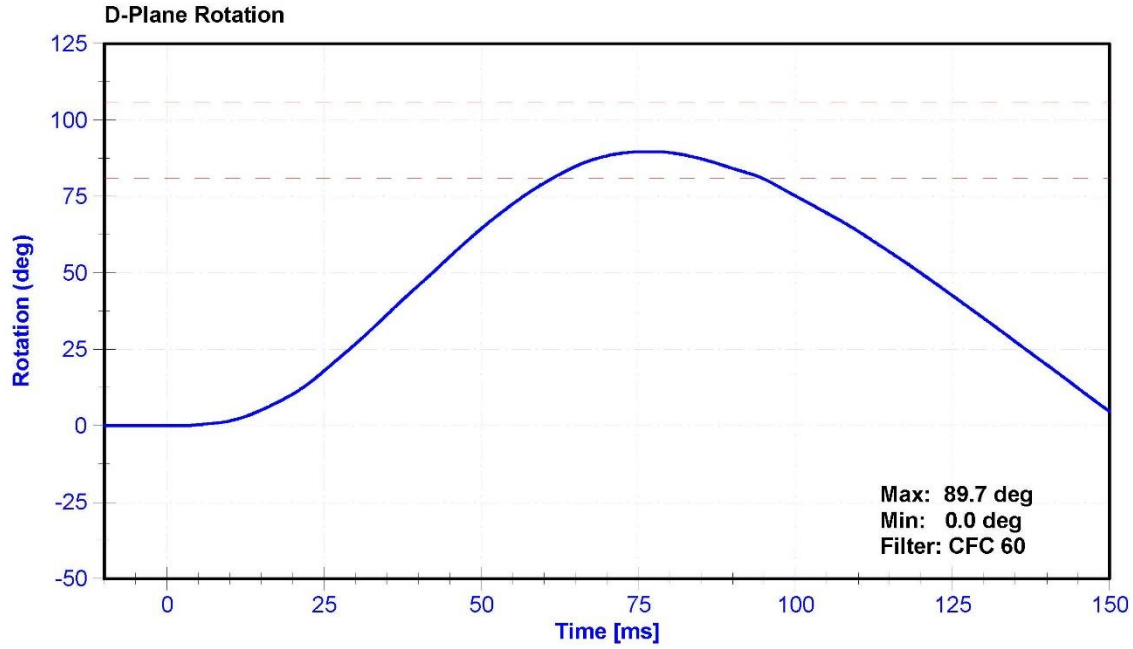
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

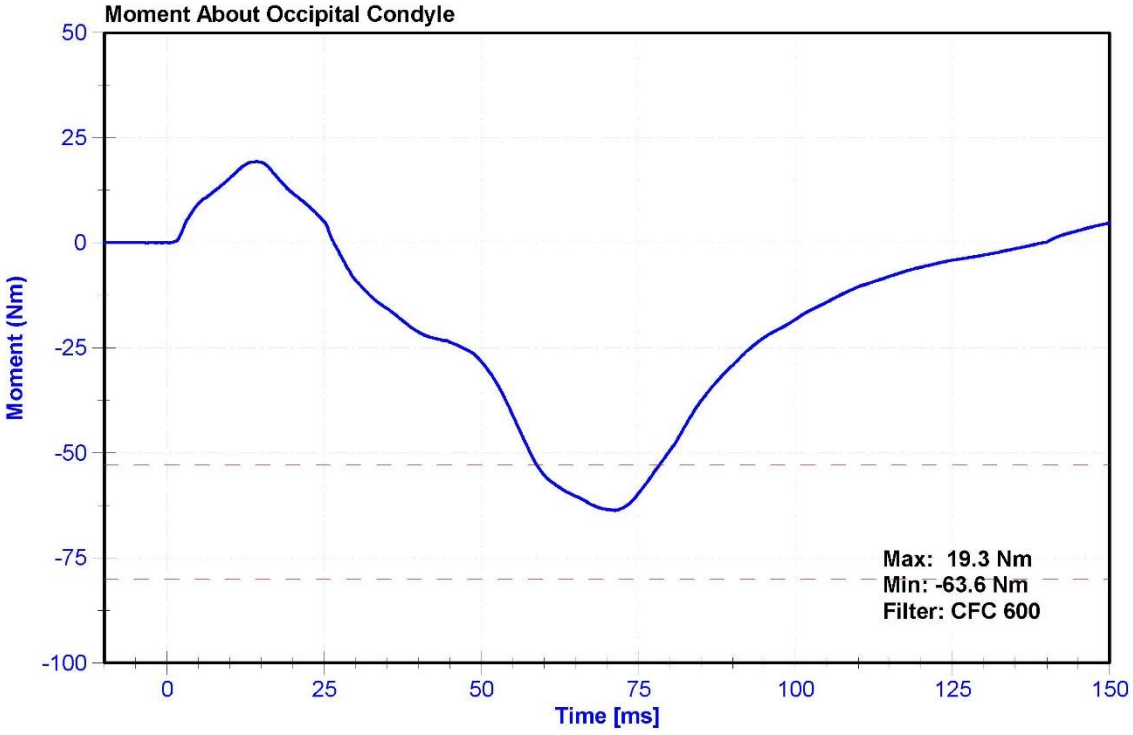
Results

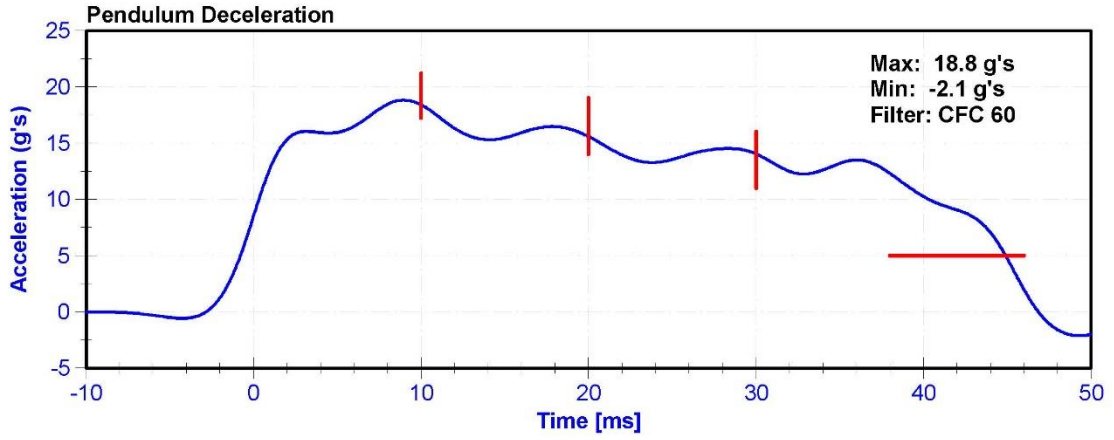
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21	Pass
Humidity	10	70	%	52.3	Pass
Velocity	5.94	6.19	m/s	6.068	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	18.41	Pass
Pendulum Deceleration at 20ms	14	19	g's	15.6	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.0	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	18.8	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	44.9	Pass
Maximum D Plane Rotation	81	106	deg	89.7	Pass
Time to Maximum Rotation	72	82	ms	76.8	Pass
Rotation Decay to Zero	147	174	ms	153.3	Pass
Minimum Moment About OC	-80	-52.9	Nm	-63.62	Pass
Time to Minimum Moment	65	79	ms	71.4	Pass
Moment Decay to Zero	120	148	ms	139.4	Pass

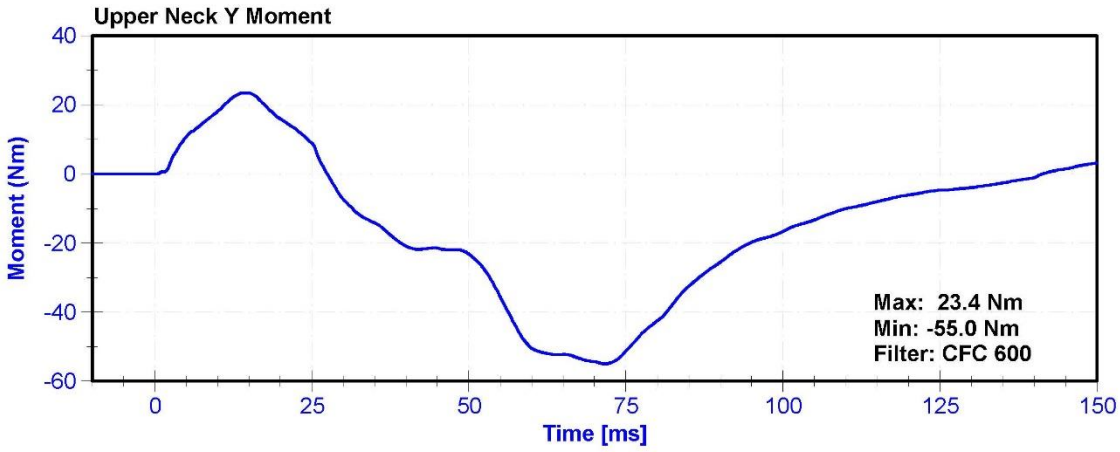
Transducer Calibrations

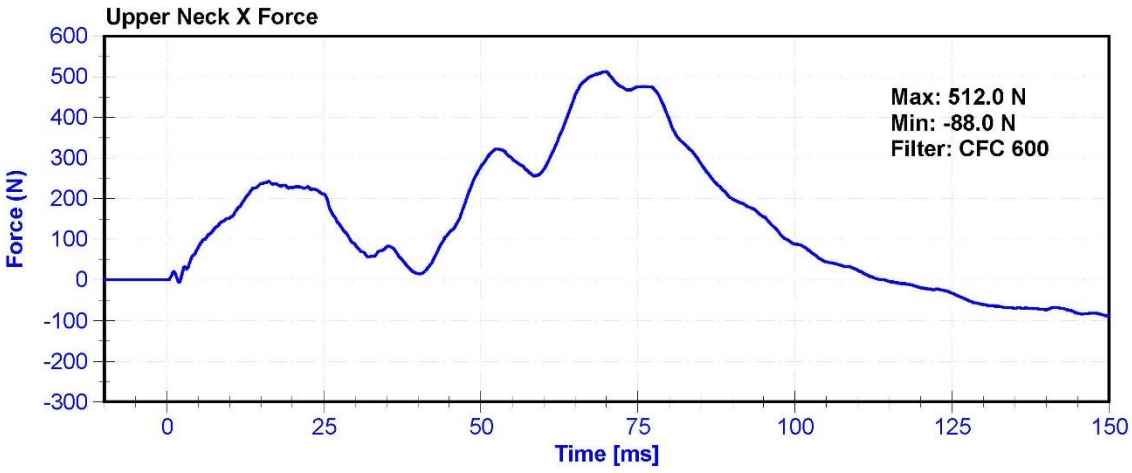
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 89.7 deg
Min: 0.0 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 19.3 Nm
Min: -63.6 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 18.8 g's
Min: -2.1 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 23.4 Nm
Min: -55.0 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 512.0 N
Min: -88.0 N
Filter: CFC 600
Force (N)
Time [ms]

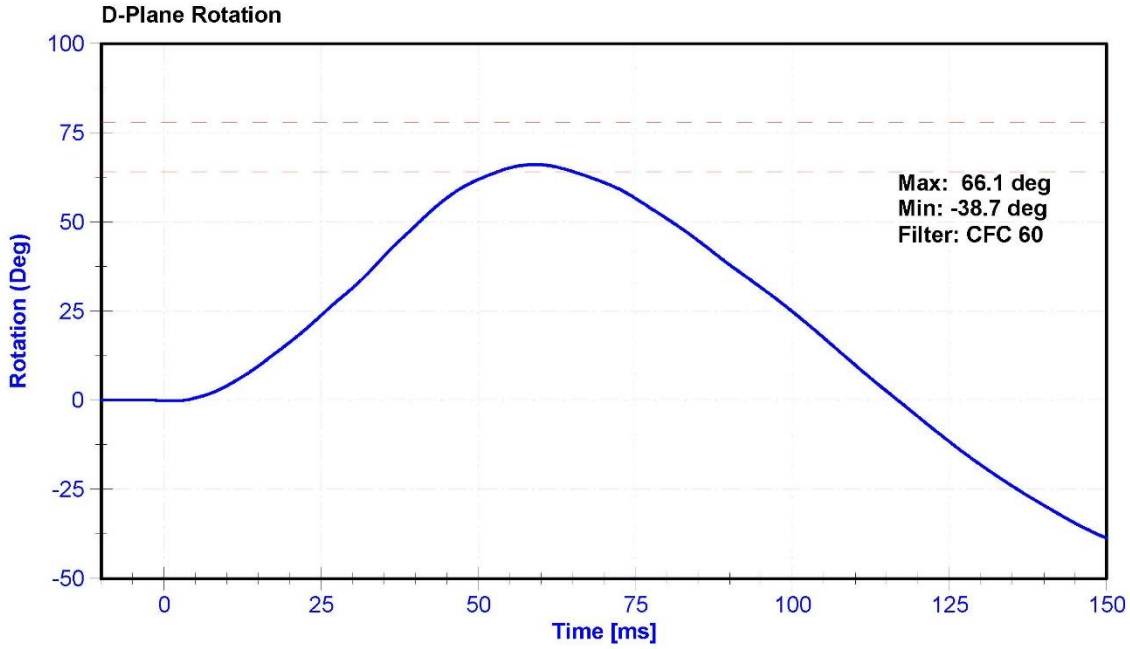
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

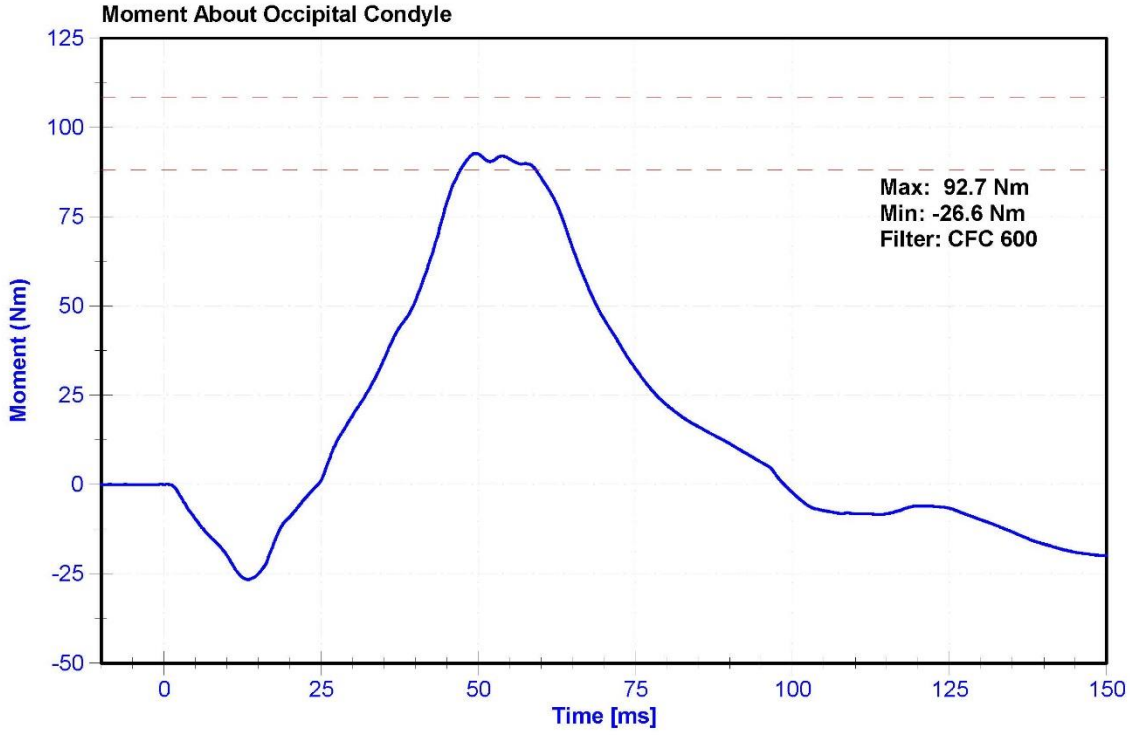
Results

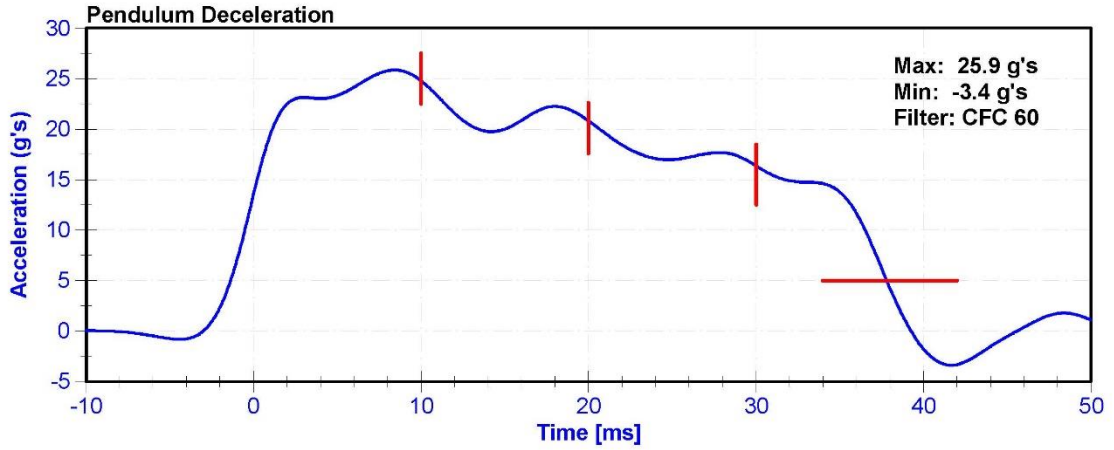
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	35.7	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	24.80	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	20.83	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	16.37	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.9	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	37.8	Pass
Maximum D Plane Rotation	64	78	deg	66.1	Pass
Time to Maximum Rotation	57	64	ms	59.1	Pass
Rotation Decay to Zero	113	127	ms	116.8	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	92.72	Pass
Time to Maximum Moment	47	58	ms	49.6	Pass
Moment Decay to Zero	97	107	ms	98.7	Pass

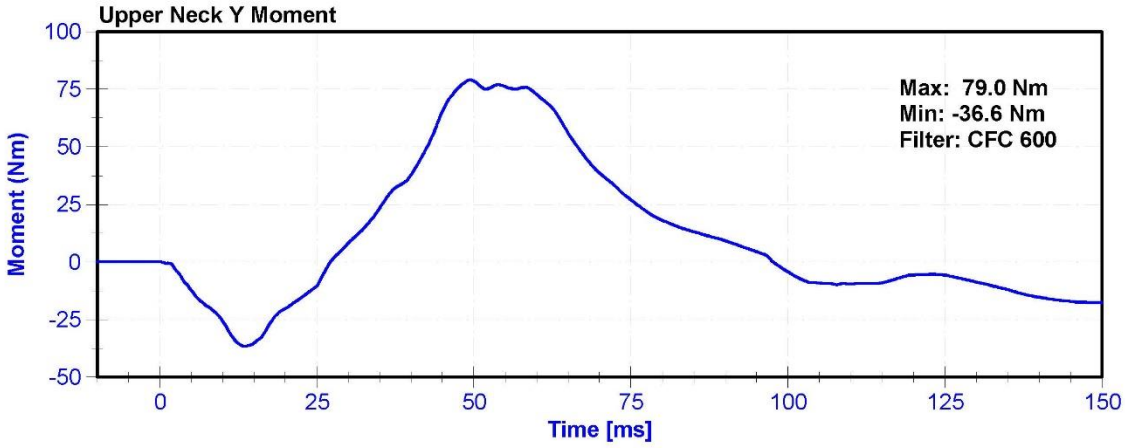
Transducer Calibrations

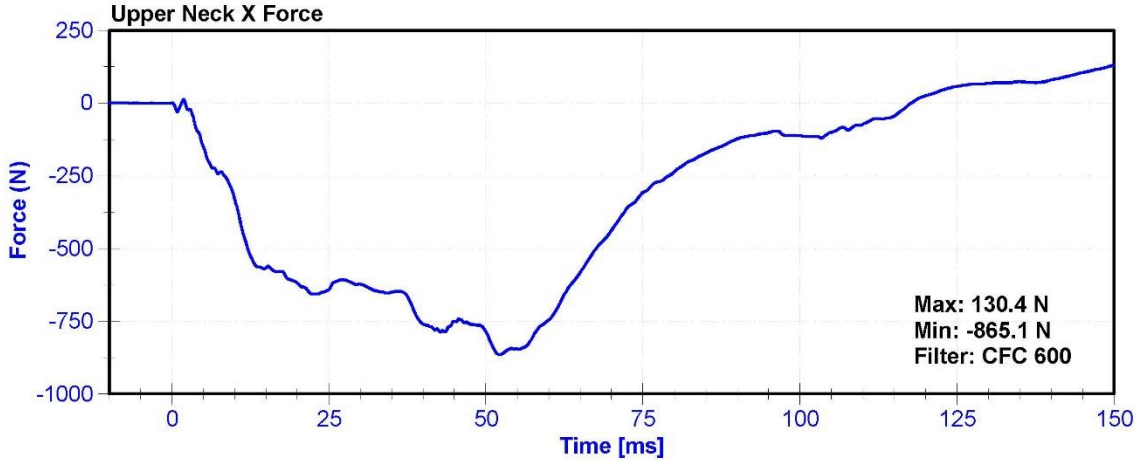
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 66.1 deg
Min: -38.7 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 92.7 Nm
Min: -26.6 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 25.9 g's
Min: -3.4 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 79.0 Nm
Min: -36.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 130.4 N
Min: -865.1 N
Filter: CFC 600
Force (N)
Time [ms]

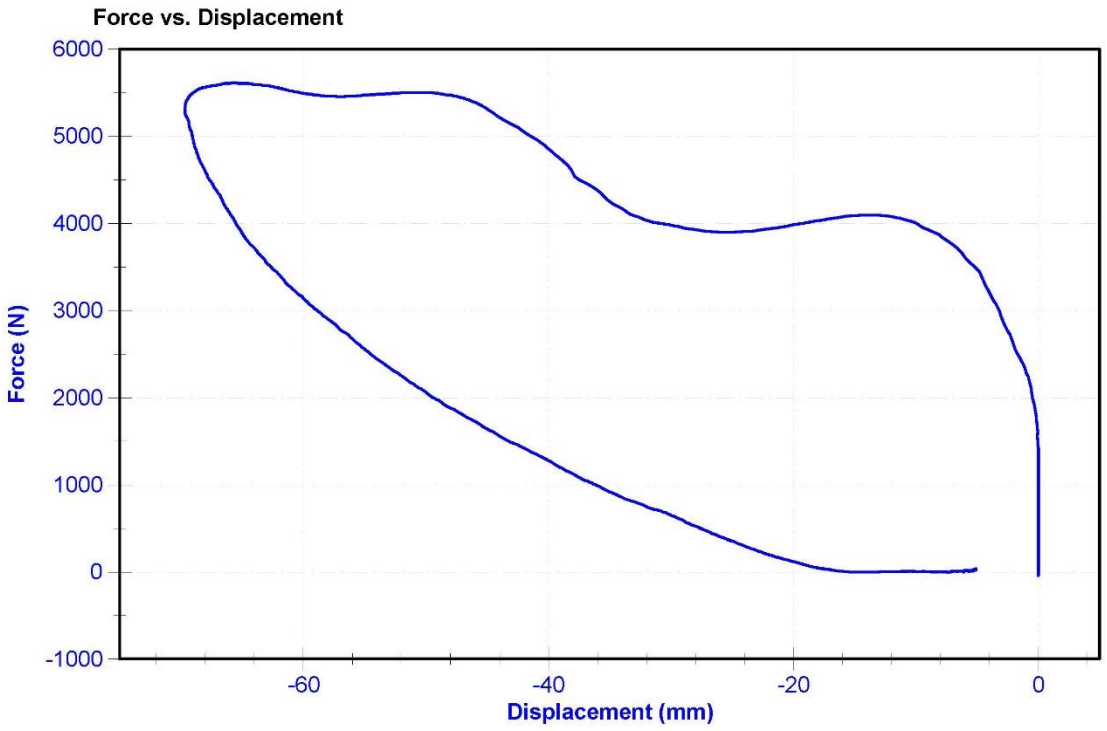
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

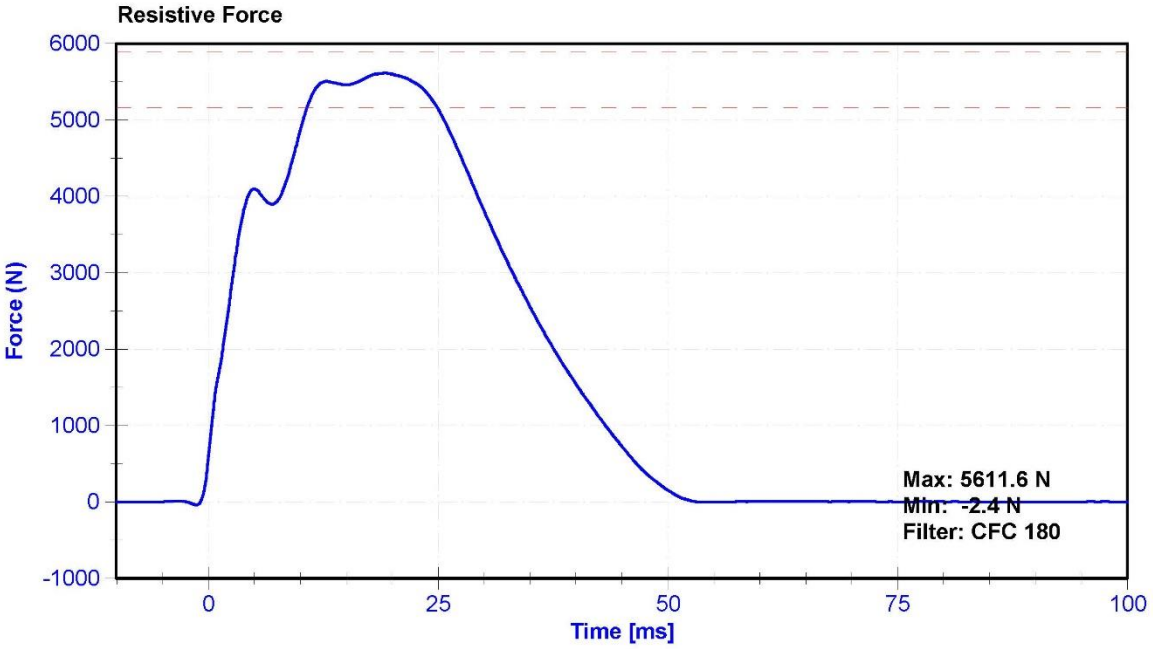
Results

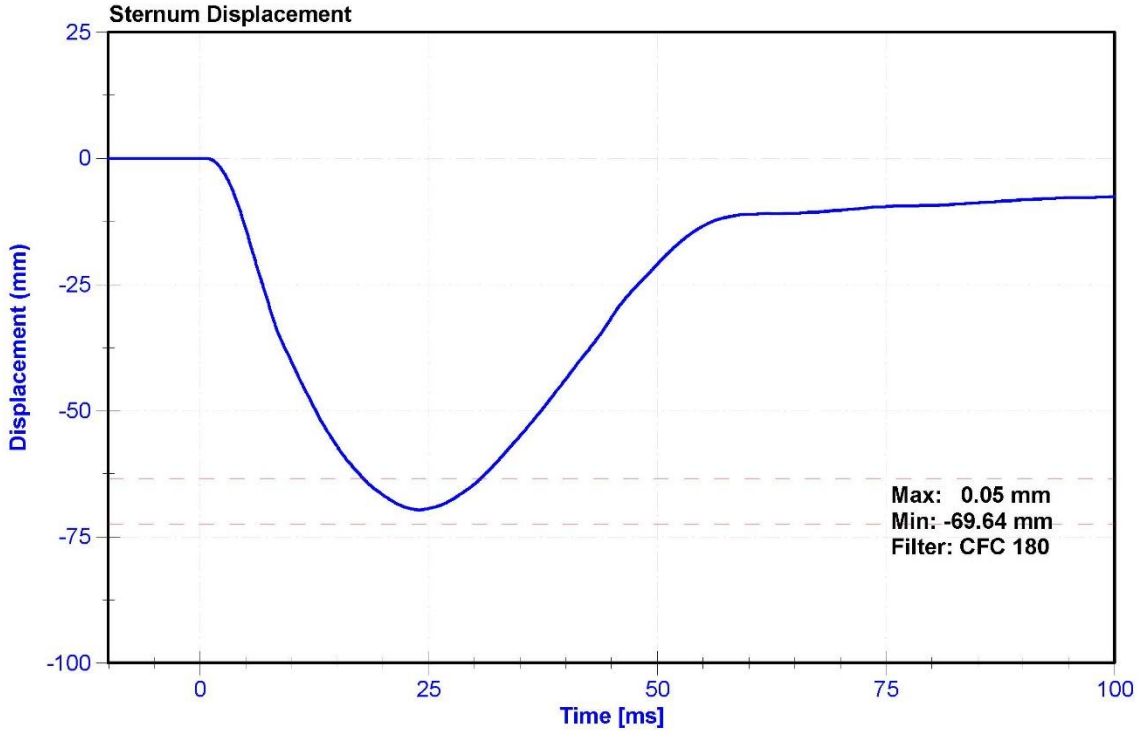
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	51.3	Pass
Velocity	6.59	6.83	m/s	6.655	Pass
Chest Displacement	-72.6	-63.5	mm	-69.64	Pass
Resistive Force	5160	5894	N	5611.6	Pass
Hysteresis	65	85	%	70.4	Pass

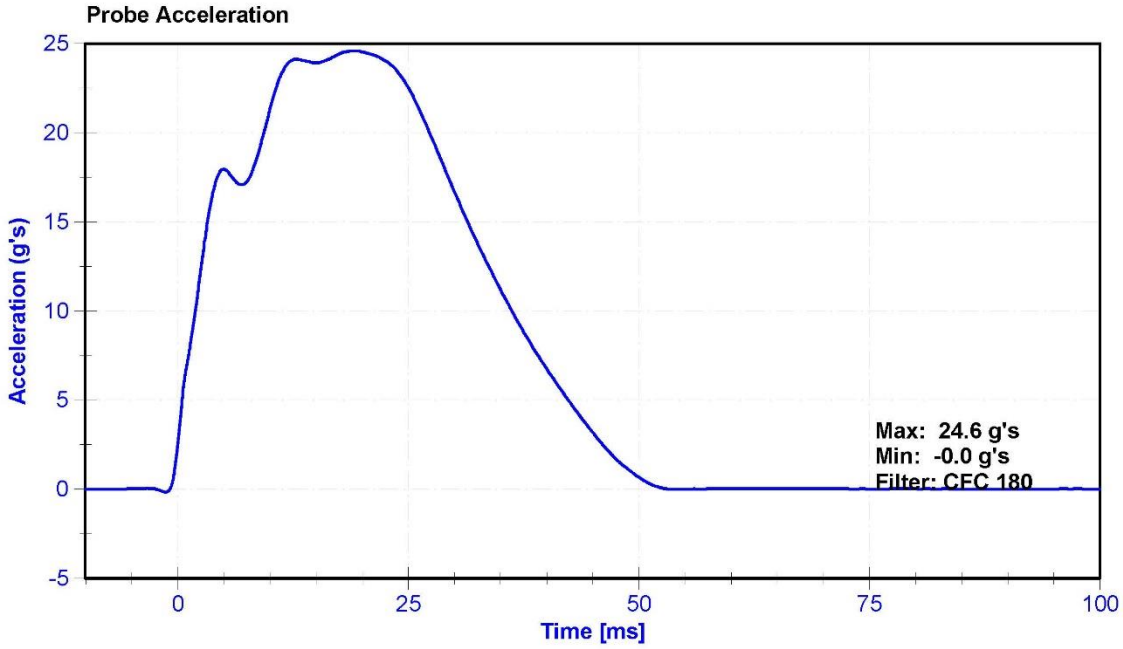
Transducer Calibrations

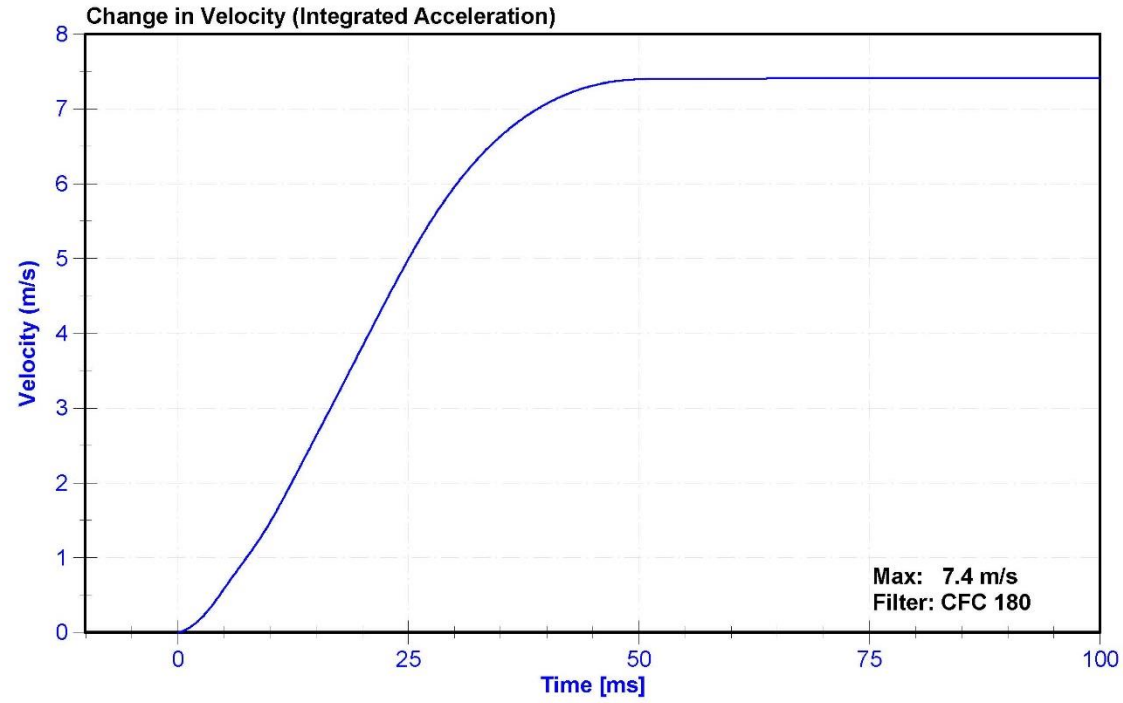
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	Servo 14CB1-2897	DS-1046	9/19/2016	9/19/2017




Resistive Force
6000
5000
4000
3000
2000
1000
0
-1000
Force (N)
0
25
50
75
100
Time [ms]
Max: 5611.6 N
Min: -2.4 N
Filter: CFC 180


Sternum Displacement
25
0
-25
-50
-75
-100
Displacement (mm)
0
25
50
75
100
Time [ms]
Max: 0.05 mm
Min: -69.64 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 24.6 g's
Min: -0.0 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.4 m/s
Filter: CFC 180

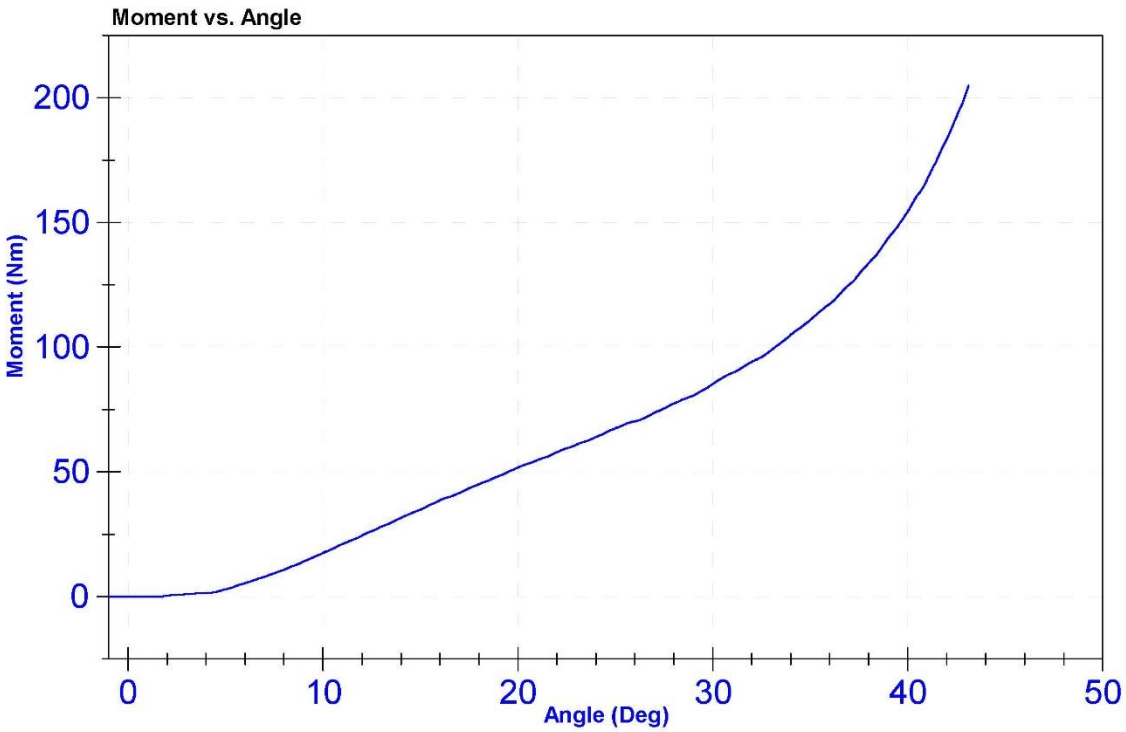
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.0	Pass
Humidity	10	70	%	35.5	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	43.0	Pass
Moment at 30 degrees	0	94.9	Nm	85.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



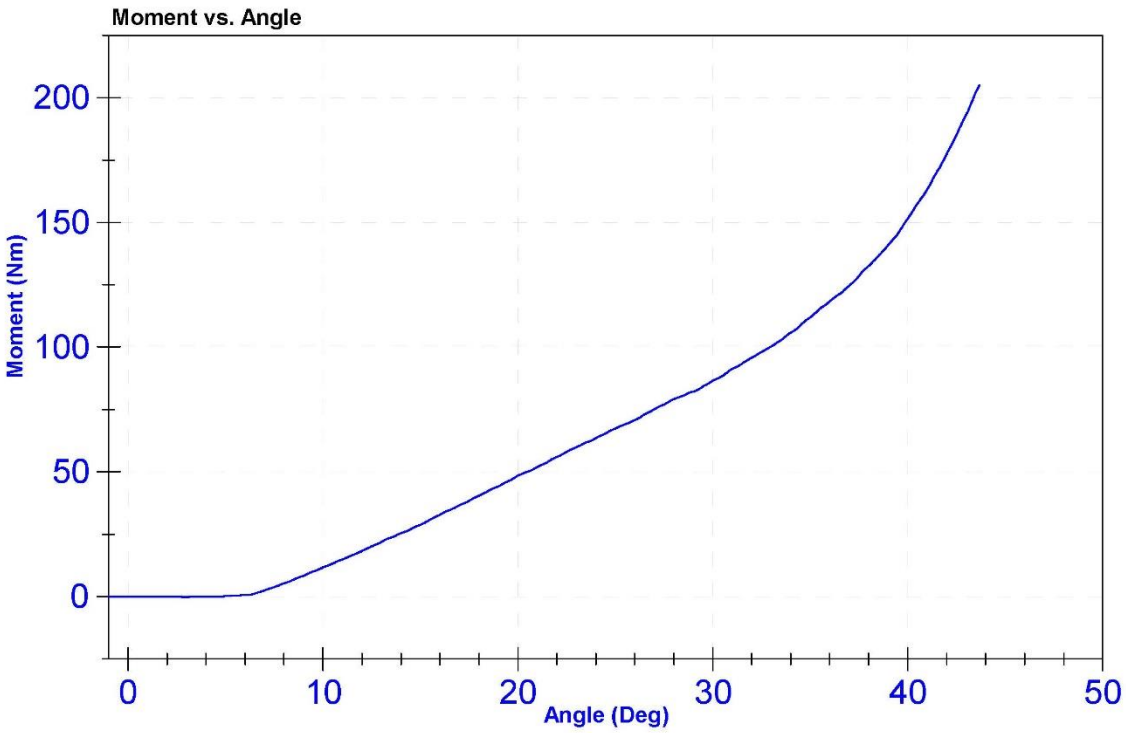
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.0	Pass
Humidity	10	70	%	35.5	Pass
Average Velocity	5	10	deg/s	7.3	Pass
Angle at 203Nm	40	50	deg	43.5	Pass
Moment at 30 degrees	0	94.9	Nm	86.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



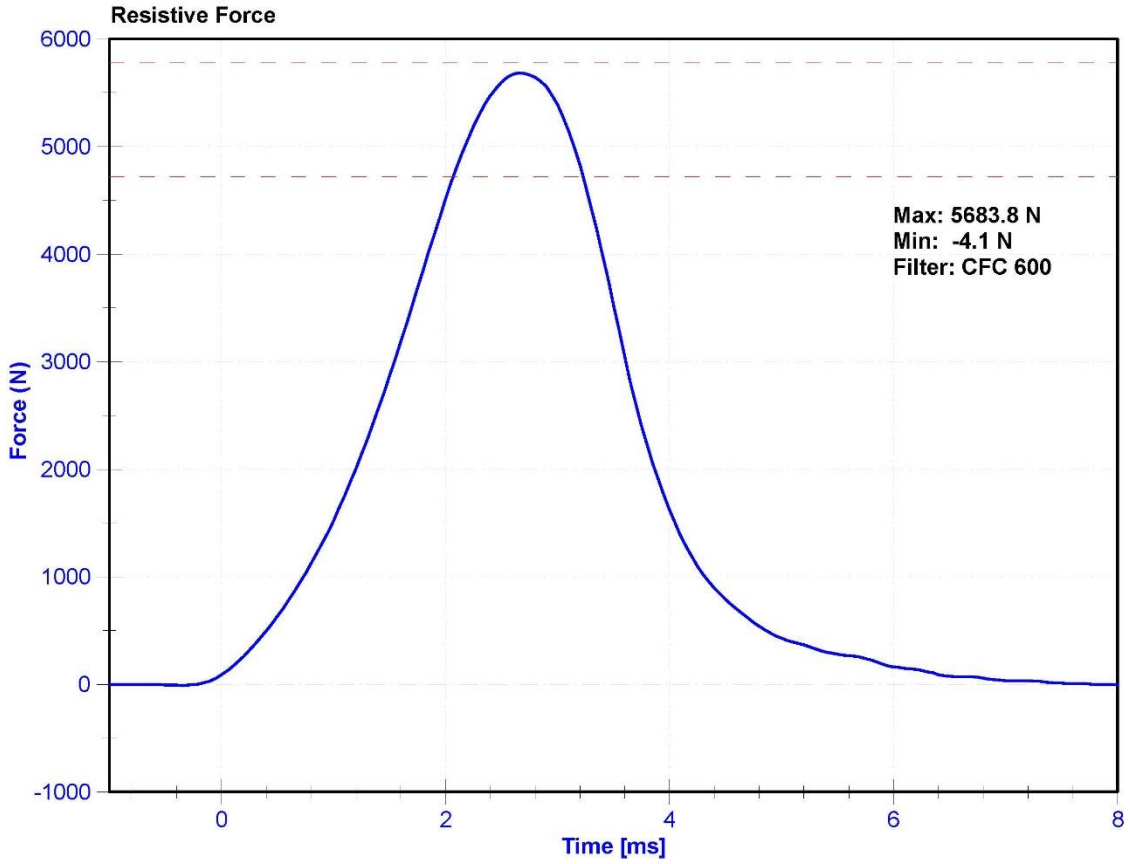
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

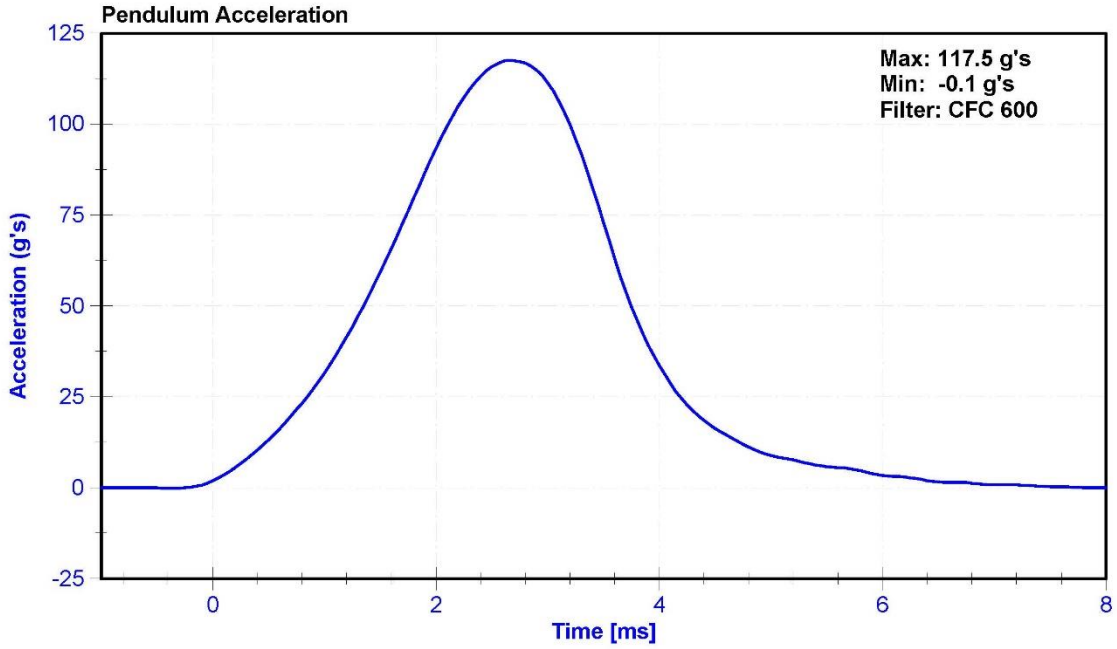
Results

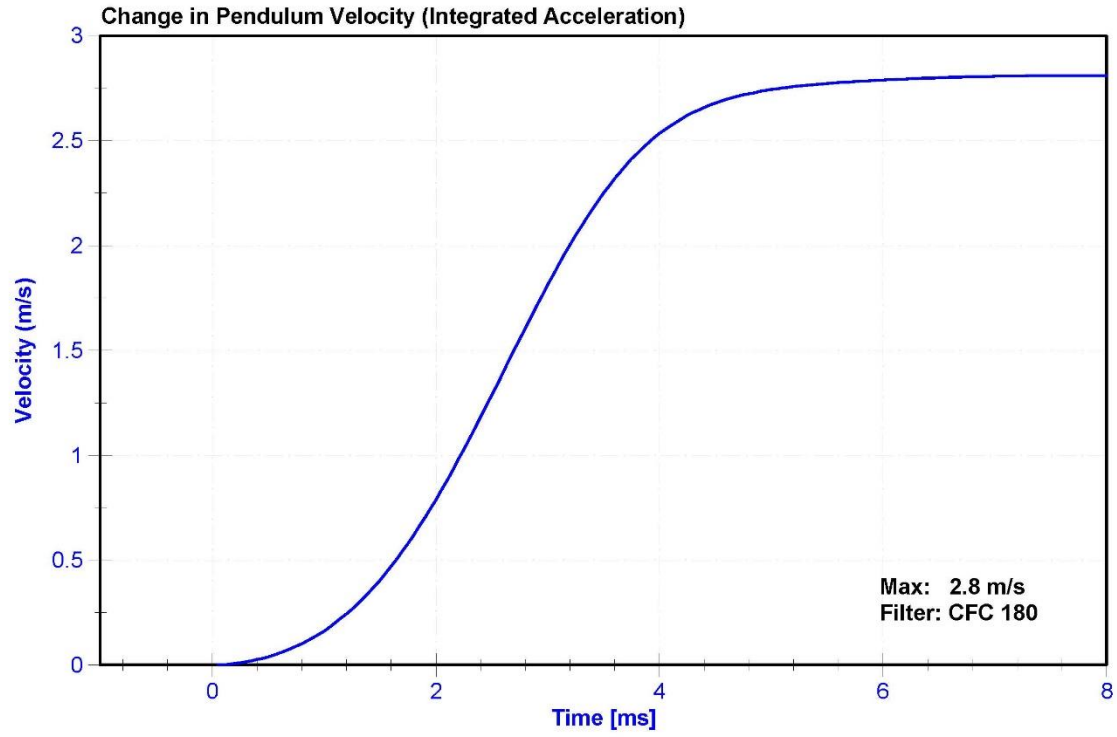
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.3	Pass
Humidity	10	70	%	30.5	Pass
Velocity	2.07	2.13	m/s	2.076	Pass
Maximum Resistive Force	4720	5780	N	5683.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Max: 117.5 g's
Min: -0.1 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.8 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

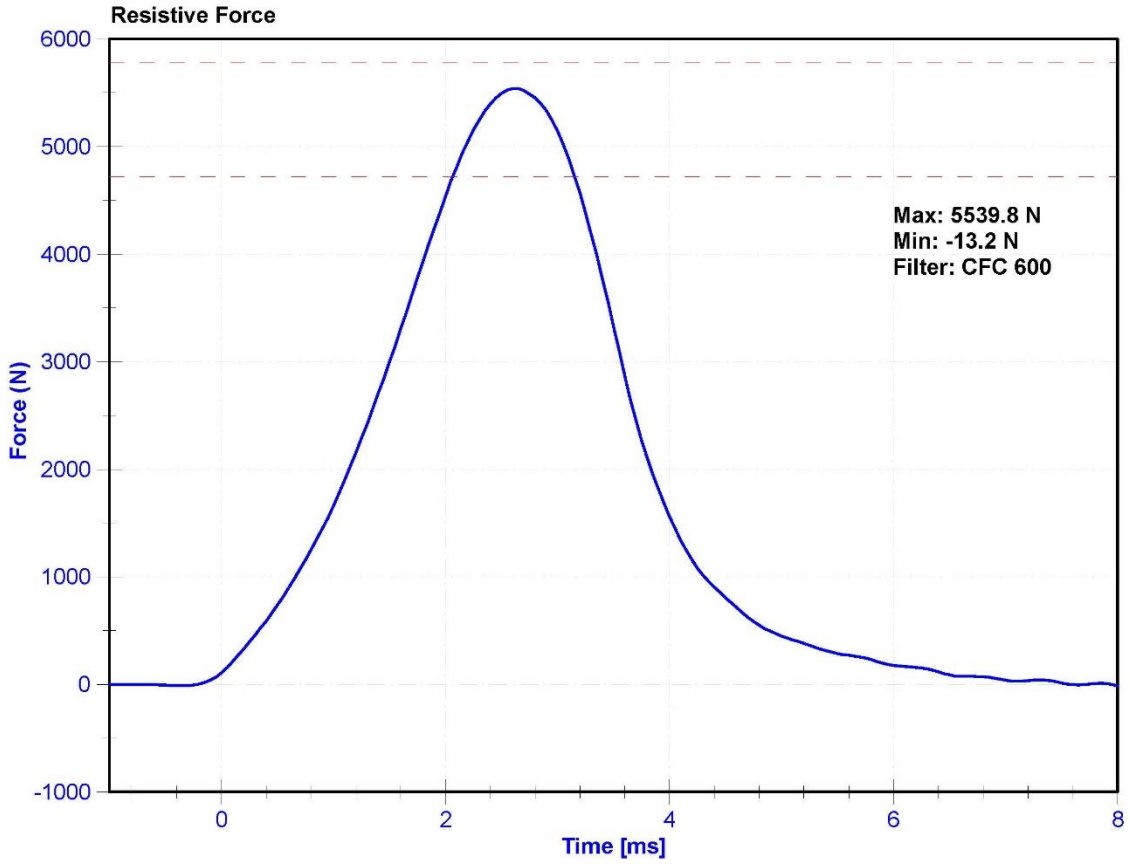
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

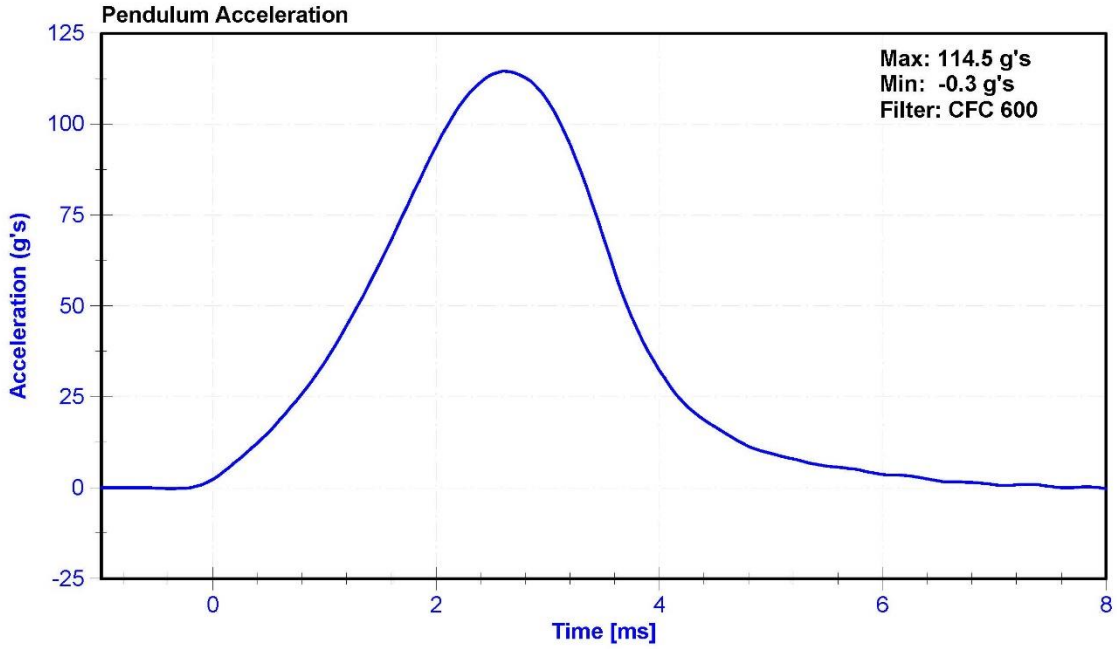
Results

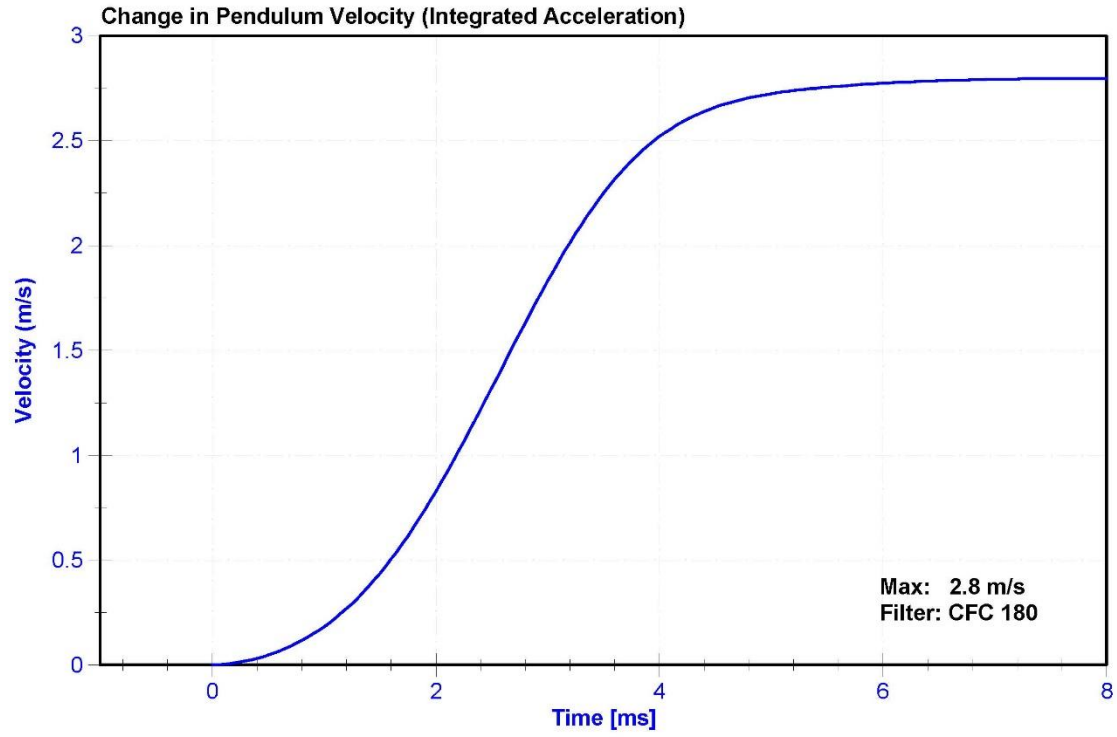
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.8	Pass
Humidity	10	70	%	34.7	Pass
Velocity	2.07	2.13	m/s	2.071	Pass
Maximum Resistive Force	4720	5780	N	5539.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Max: 114.5 g's
Min: -0.3 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.8 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

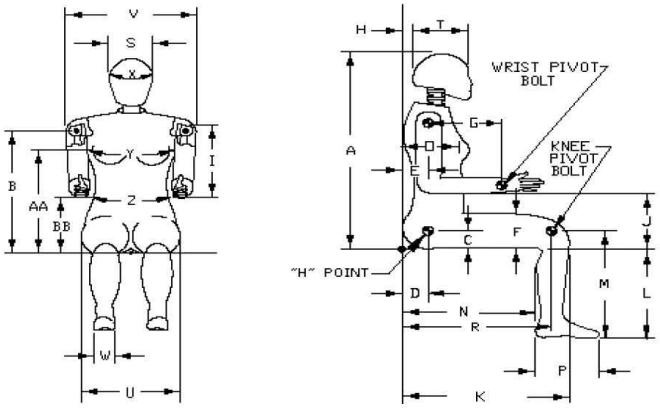
SERIAL NO: 288

Calspan

External Measurements - Hybrid 3 - 5th Female

Technician: MKG Date: 2/27/2017

Dummy Serial Number: 288



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	781	Pass
B	Shoulder Pivot Height	432	457	440	Pass
C	H-Point Height	81	86	83	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	75	Pass
F	Thigh Clearance	119	135	126	Pass
G	Back of Elbow to Wrist Pivot	244	259	249	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	285	Pass
J	Elbow Rest Height	183	203	188	Pass
K	Buttock to Knee Length	521	546	540	Pass
L	Popliteal Height	356	376	366	Pass
M	Knee Pivot Height	394	419	400	Pass
N	Buttock Popliteal Length	414	439	430	Pass
O	Chest Depth without Jacket	175	191	180	Pass
P	Foot Length (right)	219	234	220	Pass
R	Buttock To Knee Pivot Length	457	483	462	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	182	Pass
U	Hip Breadth	300	315	306	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	537	Pass
Y	Chest Circumference with Jacket	851	881	855	Pass
Z	Waist Circumference	460	790	777	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

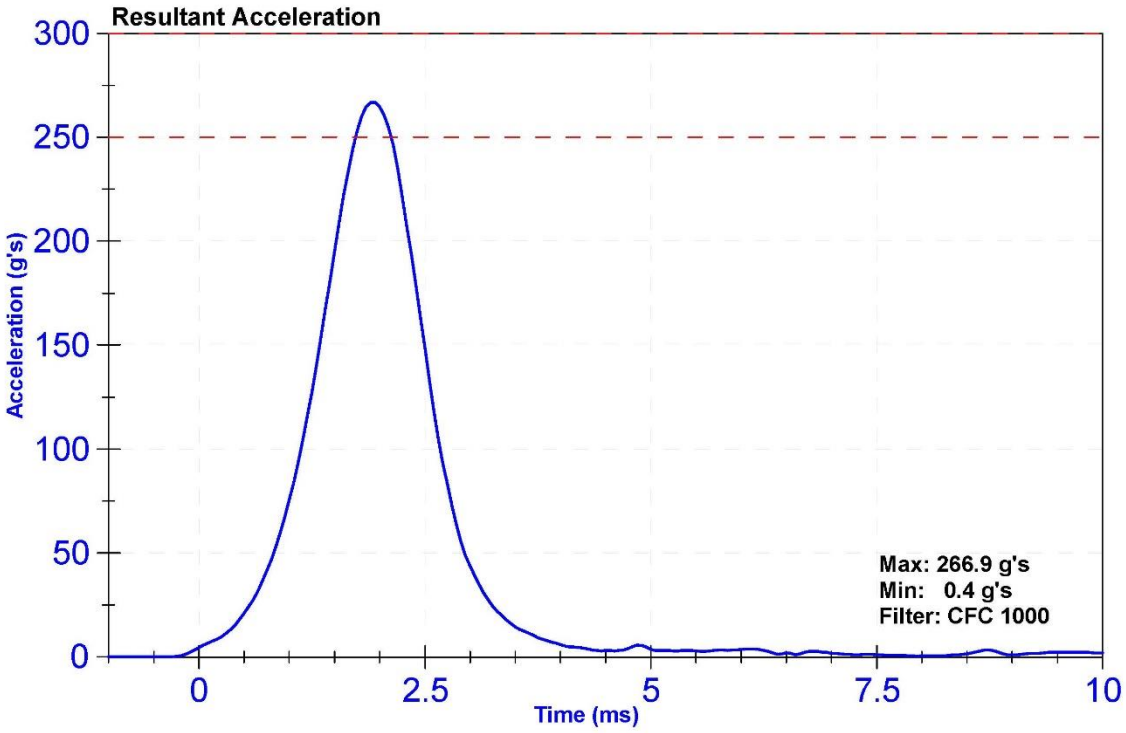
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

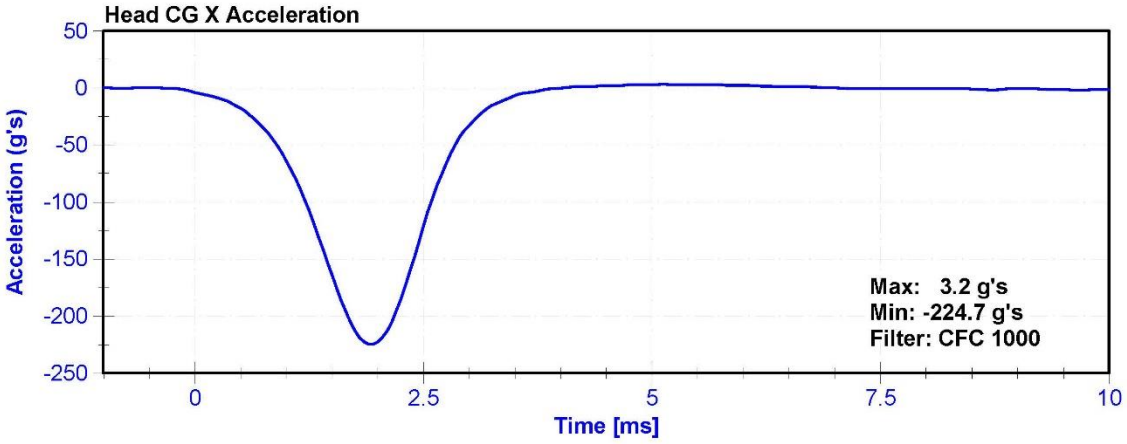
Results

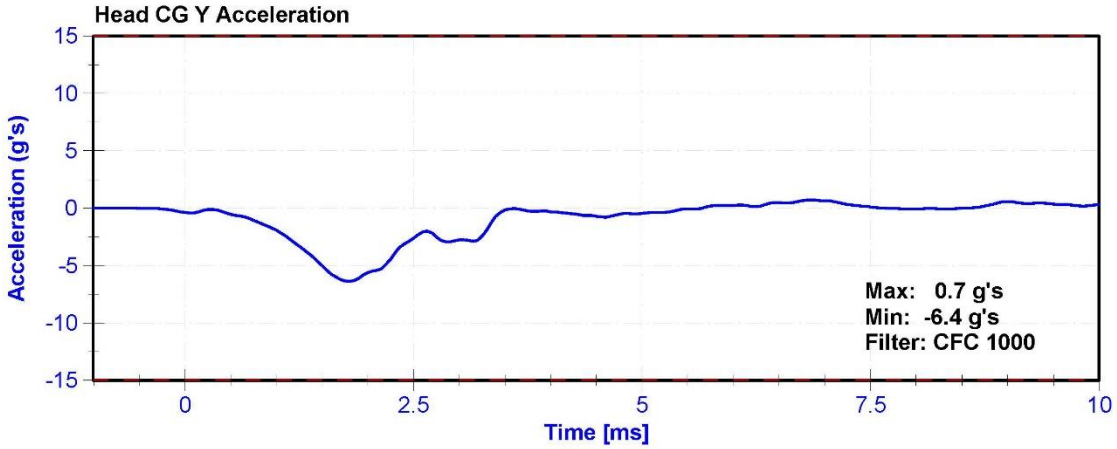
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	34.7	Pass
Resultant Acceleration	250	300	g's	266.9	Pass
Oscillation	0	10	%	2.1	Pass
Lateral Acceleration	-15	15	g's	-6.4	Pass

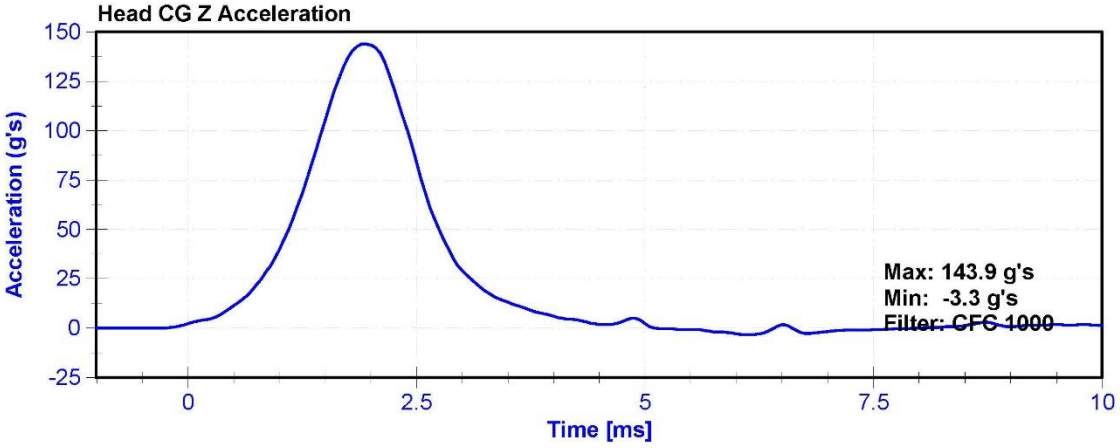
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P80337	10/3/2016	4/3/2017
Y Accelerometer	ENDEVCO 7264CT	AC-P80265	10/3/2016	4/3/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	10/3/2016	4/3/2017




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 3.2 g's
Min: -224.7 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 0.7 g's
Min: -6.4 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 143.9 g's
Min: -3.3 g's
Filter: CFC 1000

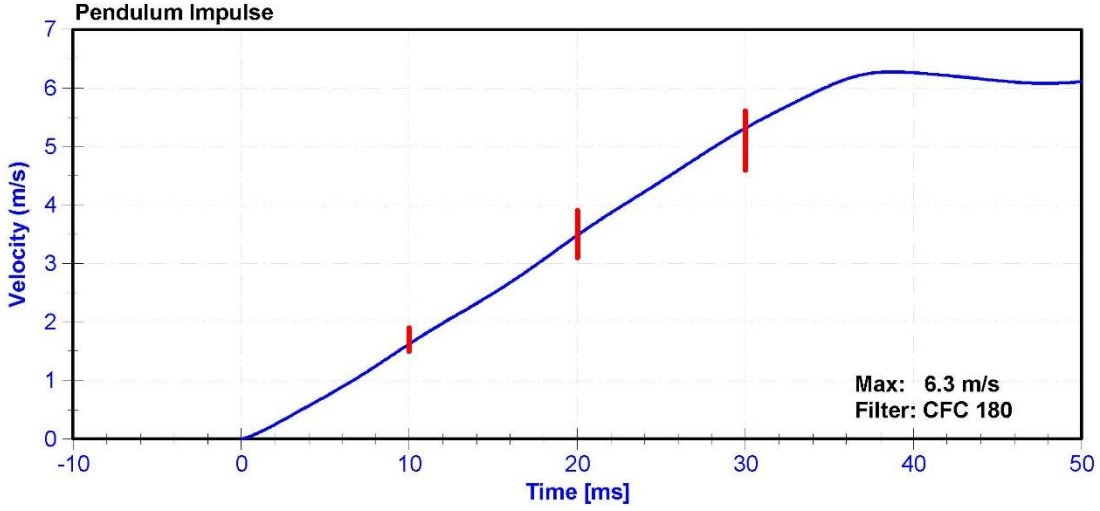
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

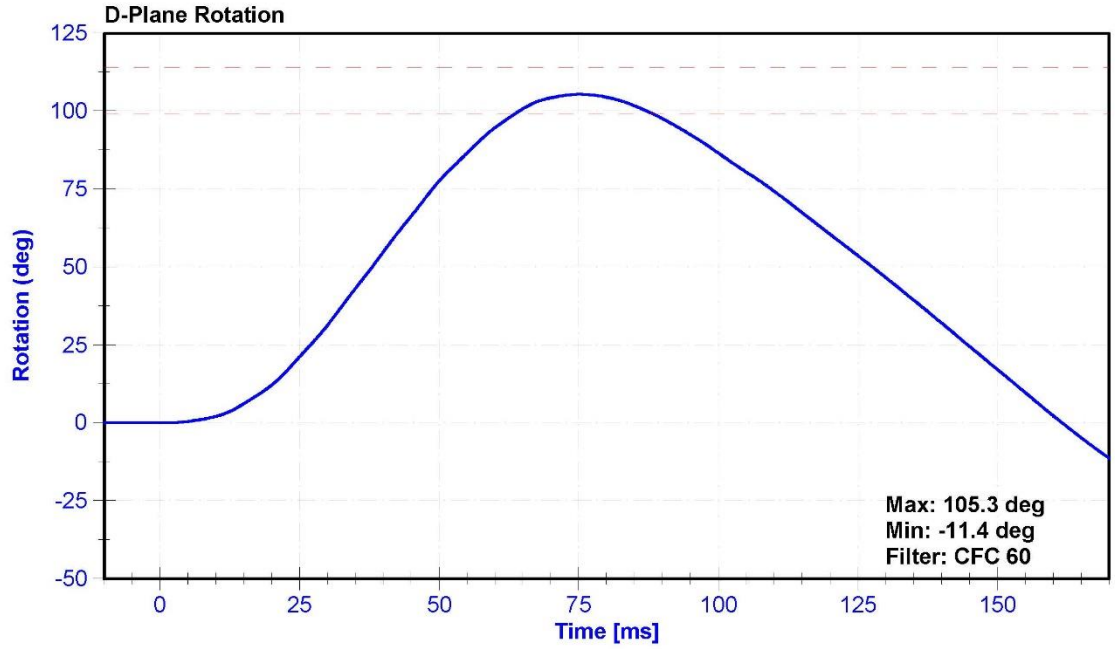
Results

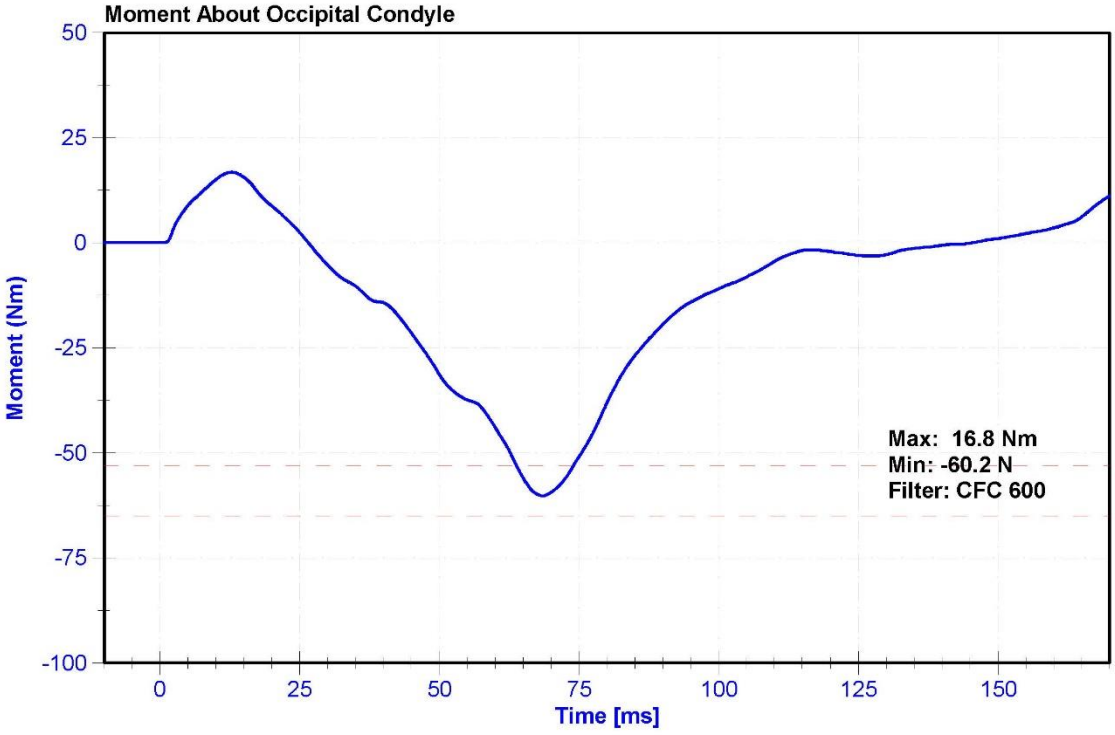
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	33.7	Pass
Velocity	5.95	6.19	m/s	6.068	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.63	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.48	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.31	Pass
D Plane Rotation	99	114	deg	105.3	Pass
Moment During Rotation Interval	-65	-53	Nm	-60.2	Pass
Moment Decay to -10Nm	94	114	ms	101.7	Pass

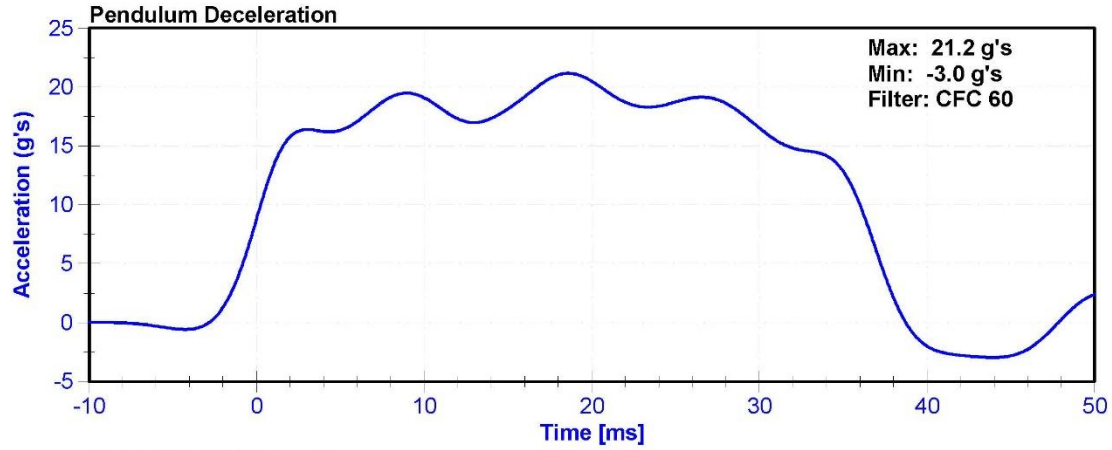
Transducer Calibrations

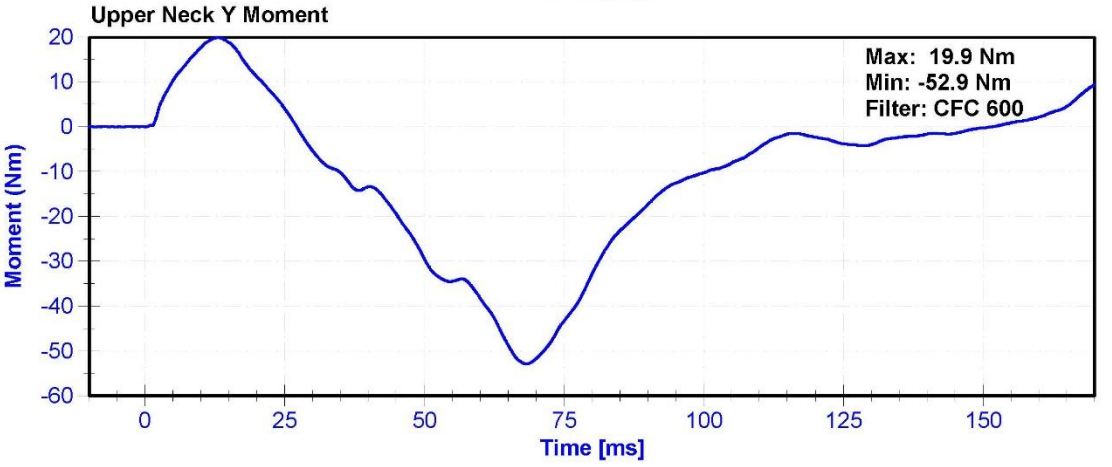
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017

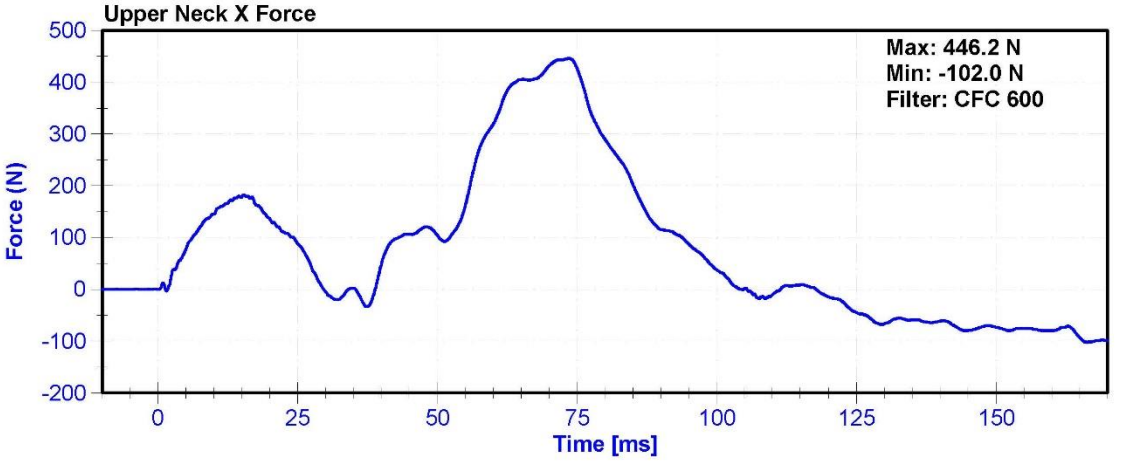



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 105.3 deg
Min: -11.4 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 16.8 Nm
Min: -60.2 N
Filter: CFC 600


Pendulum Deceleration
Max: 21.2 g's
Min: -3.0 g's
Filter: CFC 60
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 19.9 Nm
Min: -52.9 Nm
Filter: CFC 600
Moment (Nm)
20
10
0
-10
-20
-30
-40
-50
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 446.2 N
Min: -102.0 N
Filter: CFC 600
Force (N)
500
400
300
200
100
0
-100
-200
0
25
50
75
100
125
150
Time [ms]

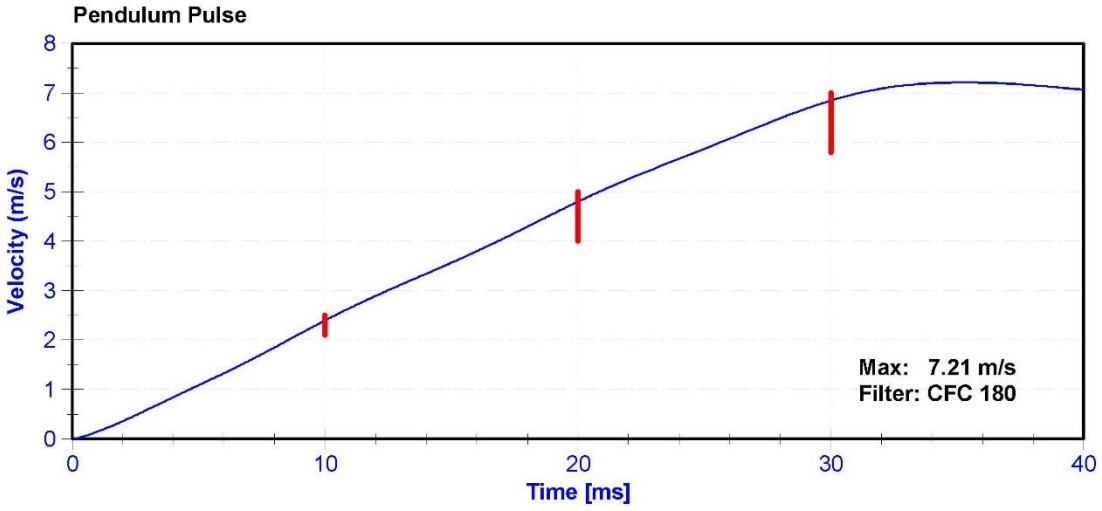
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

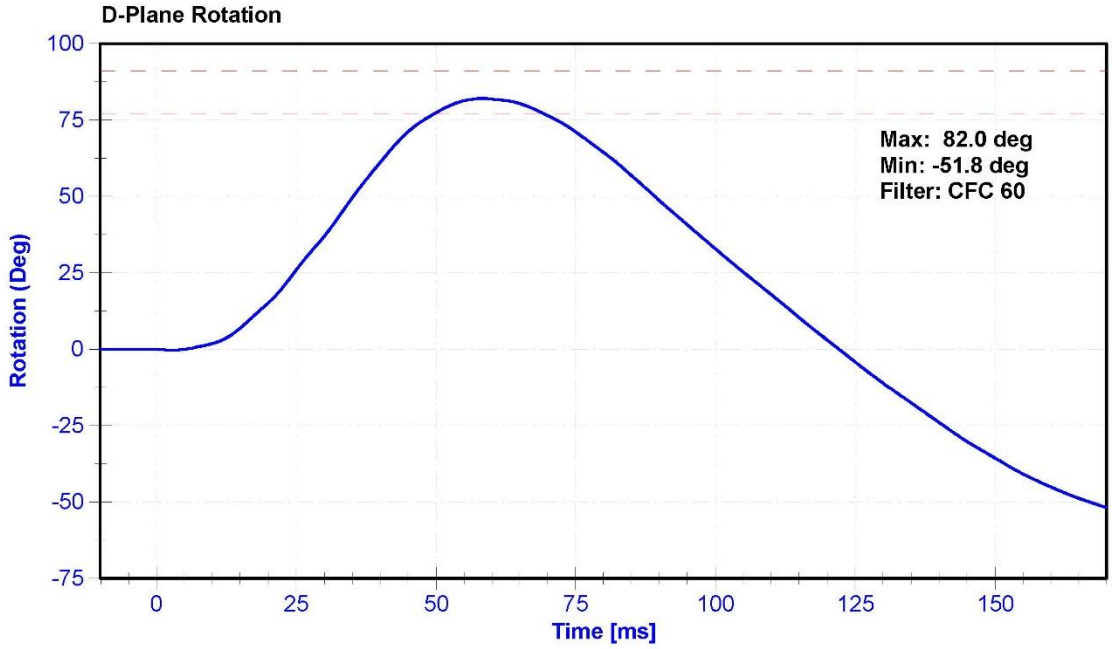
Results

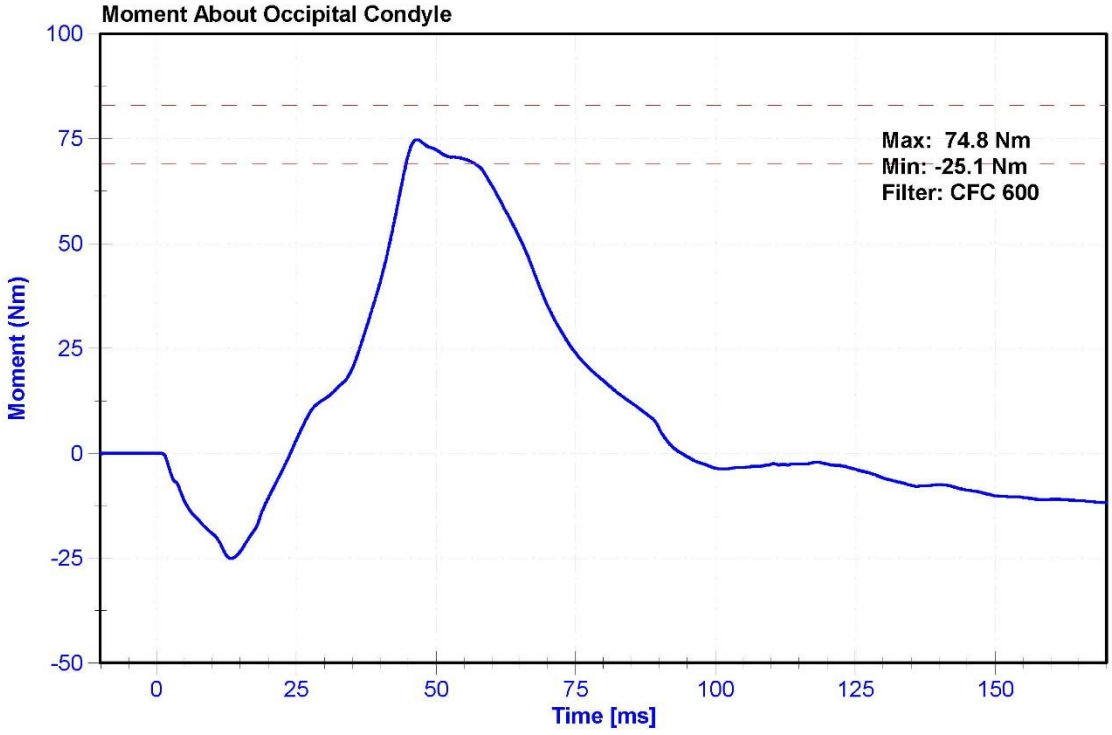
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	33.9	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.40	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.80	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.84	Pass
Max D Plane Rotation	77	91	deg	82.0	Pass
Max Moment During Rotation Interval	69	83	Nm	74.8	Pass
Moment Decay to 10.0 Nm	80	100	ms	87.1	Pass

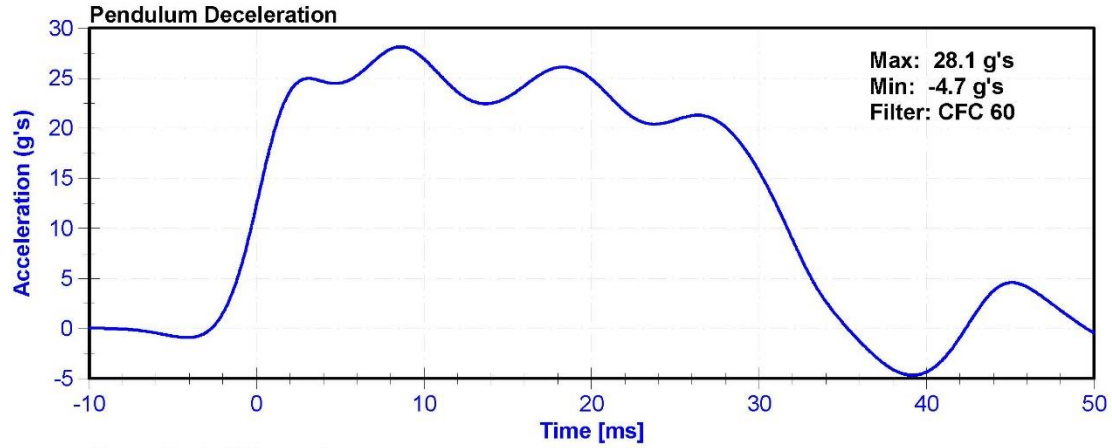
Transducer Calibrations

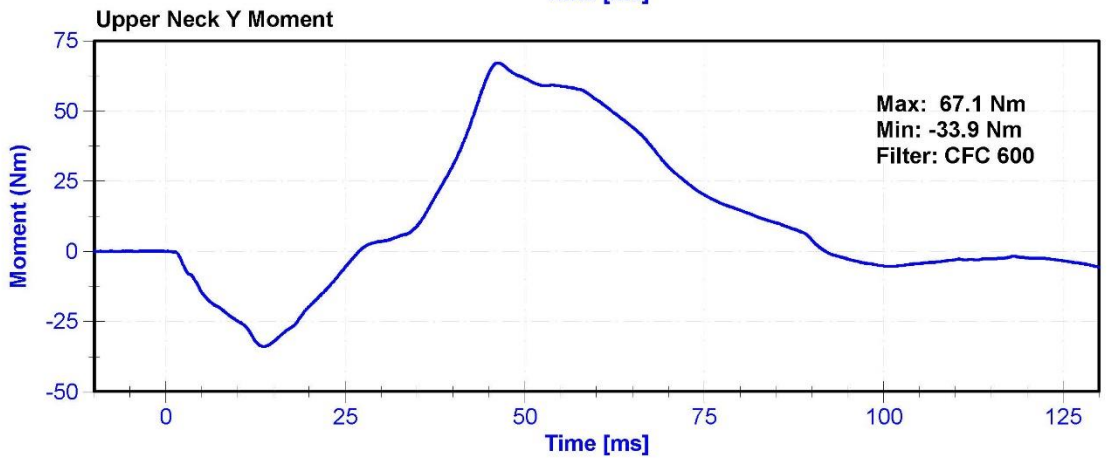
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017

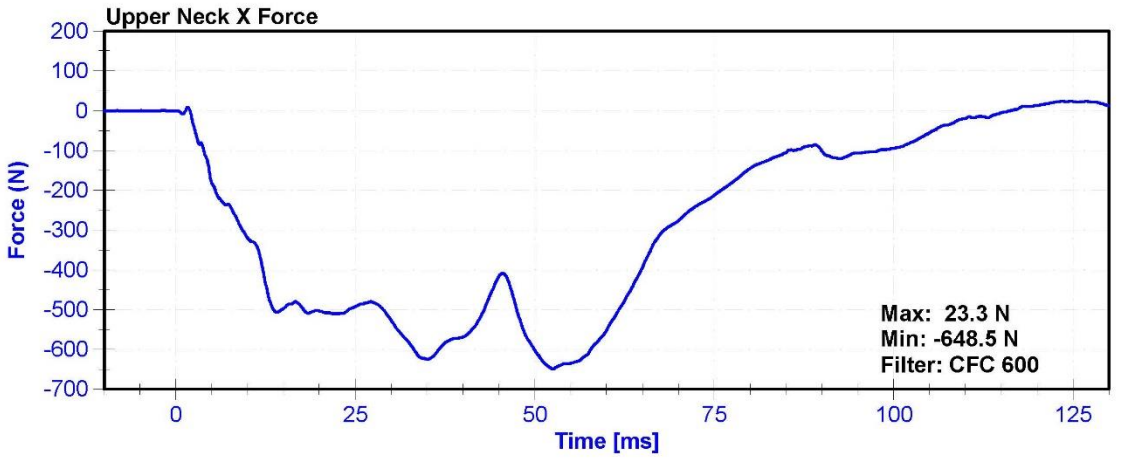



D-Plane Rotation
Max: 82.0 deg
Min: -51.8 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 74.8 Nm
Min: -25.1 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150


Pendulum Deceleration
Max: 28.1 g's
Min: -4.7 g's
Filter: CFC 60
Acceleration (g's)
30
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 67.1 Nm
Min: -33.9 Nm
Filter: CFC 600
Moment (Nm)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Upper Neck X Force
Max: 23.3 N
Min: -648.5 N
Filter: CFC 600
Force (N)
200
100
0
-100
-200
-300
-400
-500
-600
-700
0
25
50
75
100
125
Time [ms]

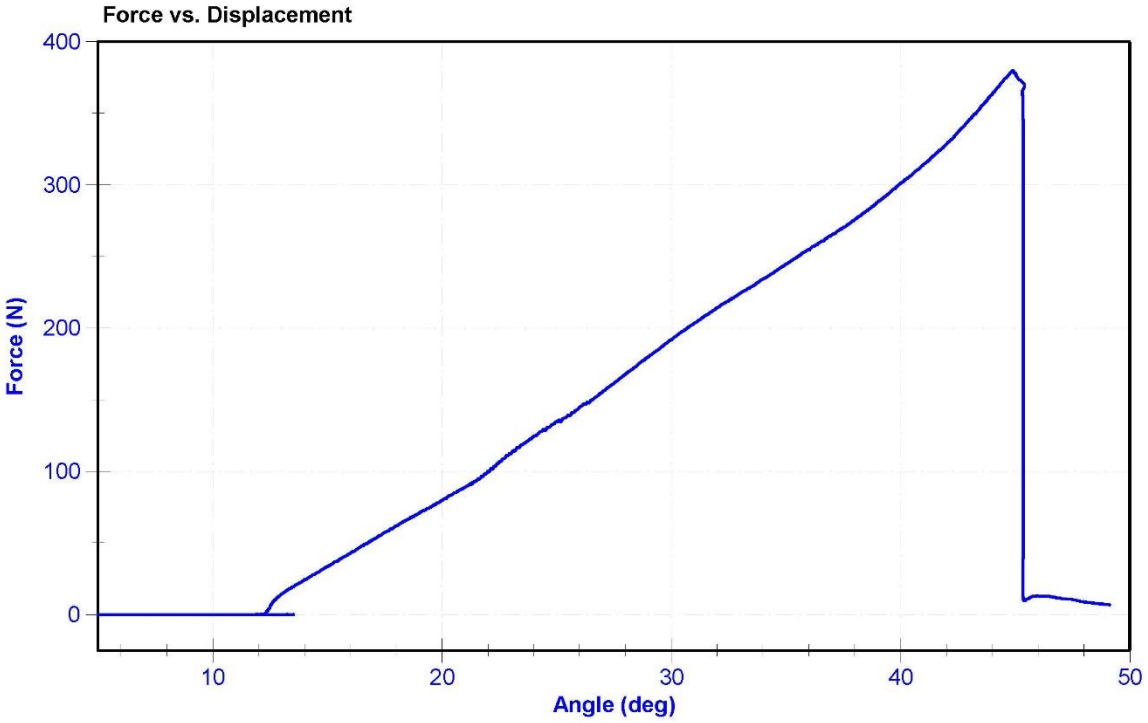
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.3	Pass
Humidity	10	70	%	31.9	Pass
Initial Angle	0	20	deg	12.2	Pass
Force at 45 Degrees	320	390	N	379.7	Pass
Return Angle Relative to Initial	0	8	deg	4.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	9/7/2016	9/7/2017
Load Cell	Interface SML-200	LC-493319	9/7/2016	9/7/2017



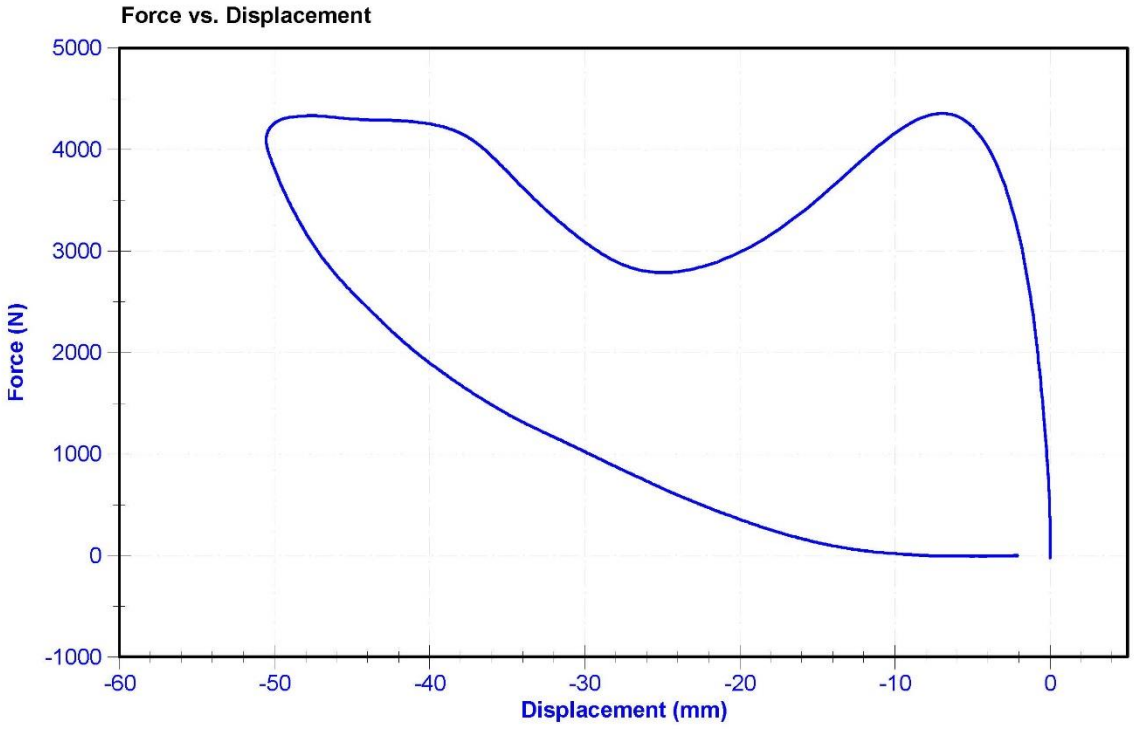
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

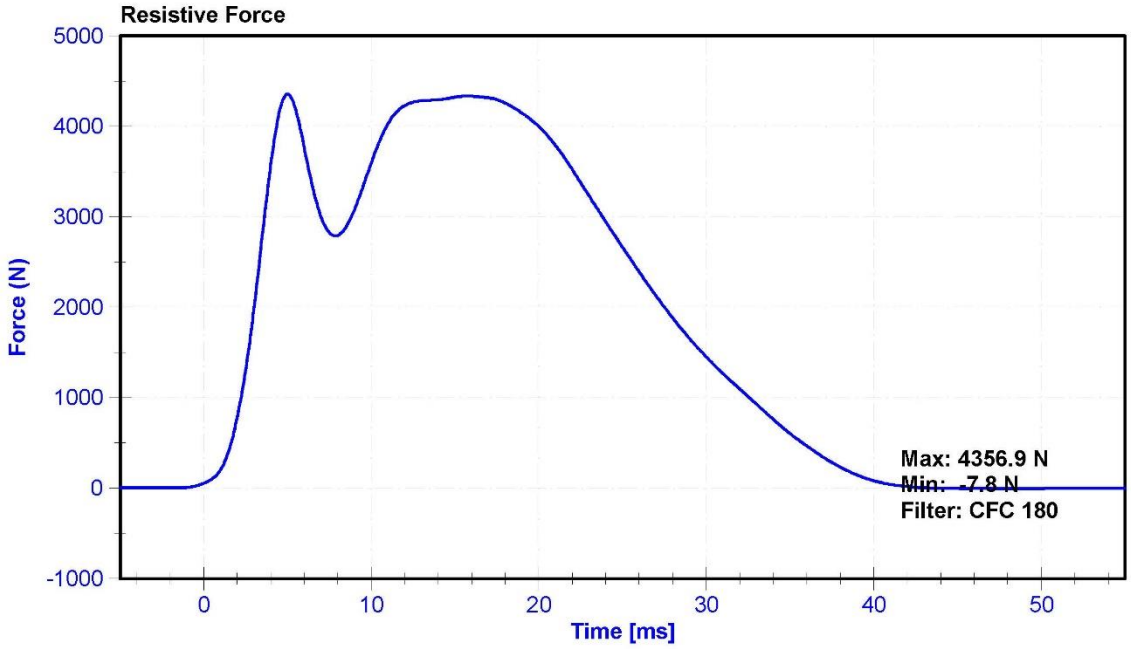
Results

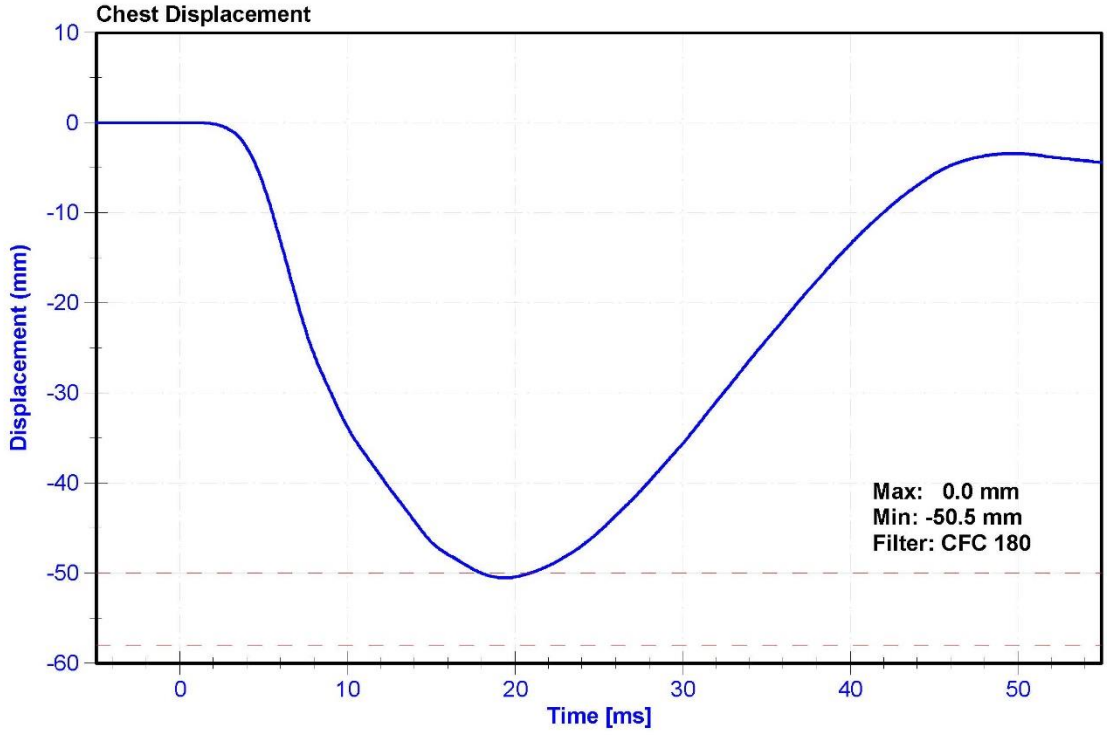
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	29.2	Pass
Velocity	6.59	6.83	m/s	6.641	Pass
Chest Deflection	-58	-50	mm	-50.5	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4262.2	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4334.6	Pass
Hysteresis	69	85	%	72.2	Pass

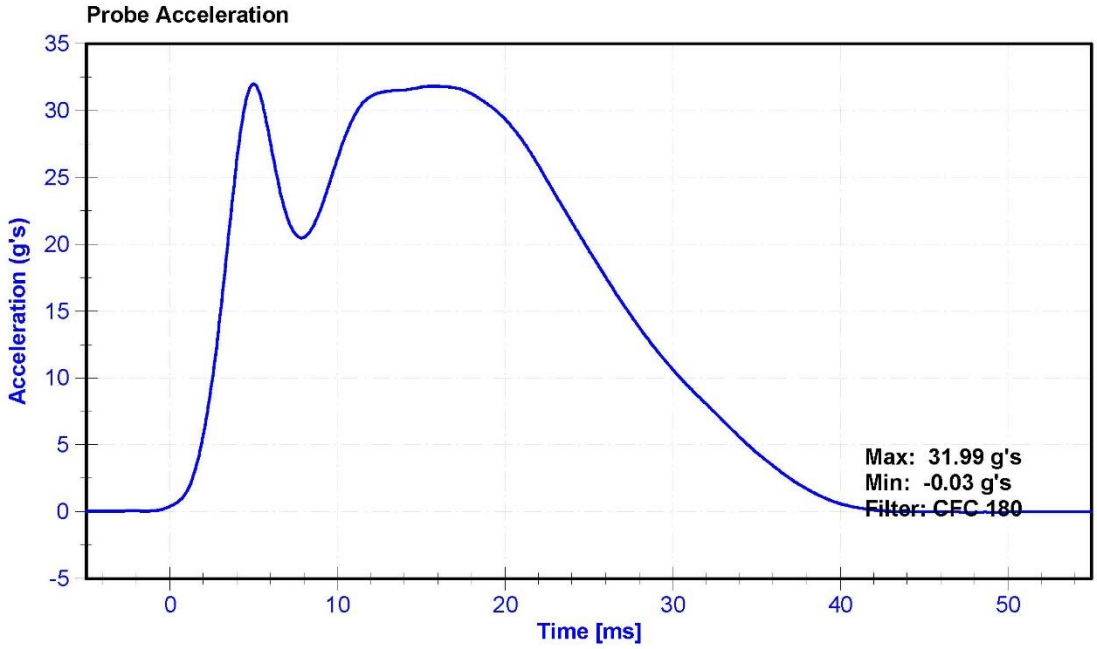
Transducer Calibrations

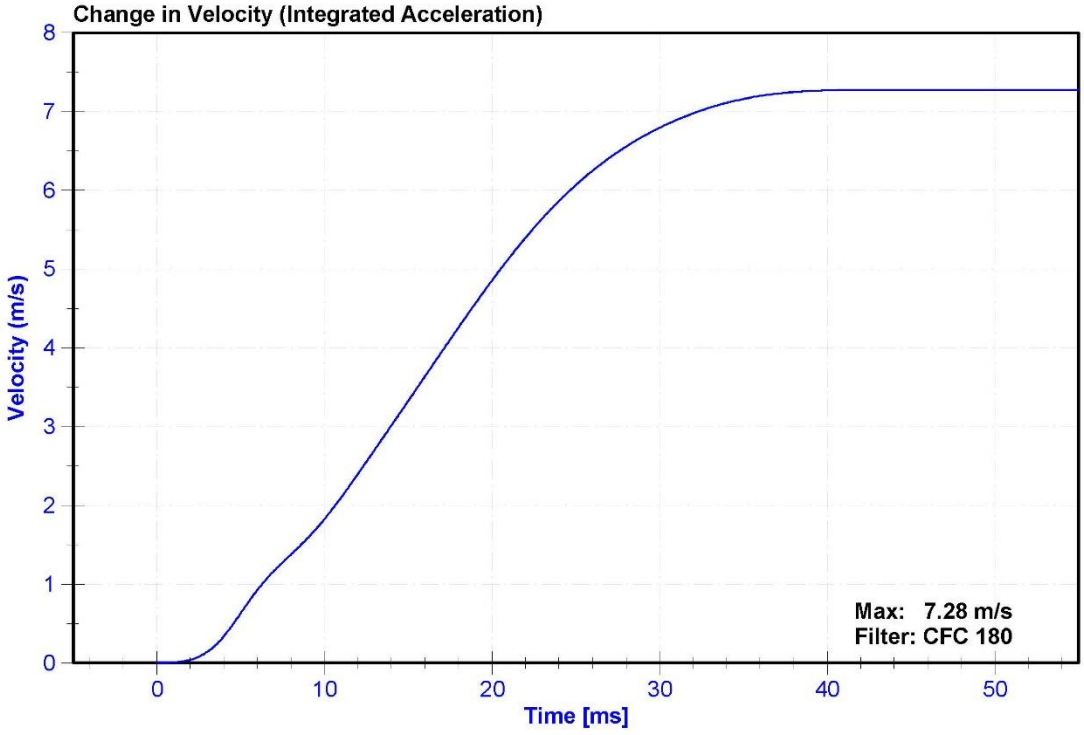
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	SERVO 14CB1-2897	DS-288	9/30/2016	9/30/2017




Resistive Force
5000
4000
3000
2000
1000
0
-1000
Force (N)
0
10
20
30
40
50
Time [ms]
Max: 4356.9 N
Min: -7.8 N
Filter: CFC 180


Chest Displacement
10
0
-10
-20
-30
-40
-50
-60
Displacement (mm)
0
10
20
30
40
50
Time [ms]
Max: 0.0 mm
Min: -50.5 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
35
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]
Max: 31.99 g's
Min: -0.03 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]
Max: 7.28 m/s
Filter: CFC 180

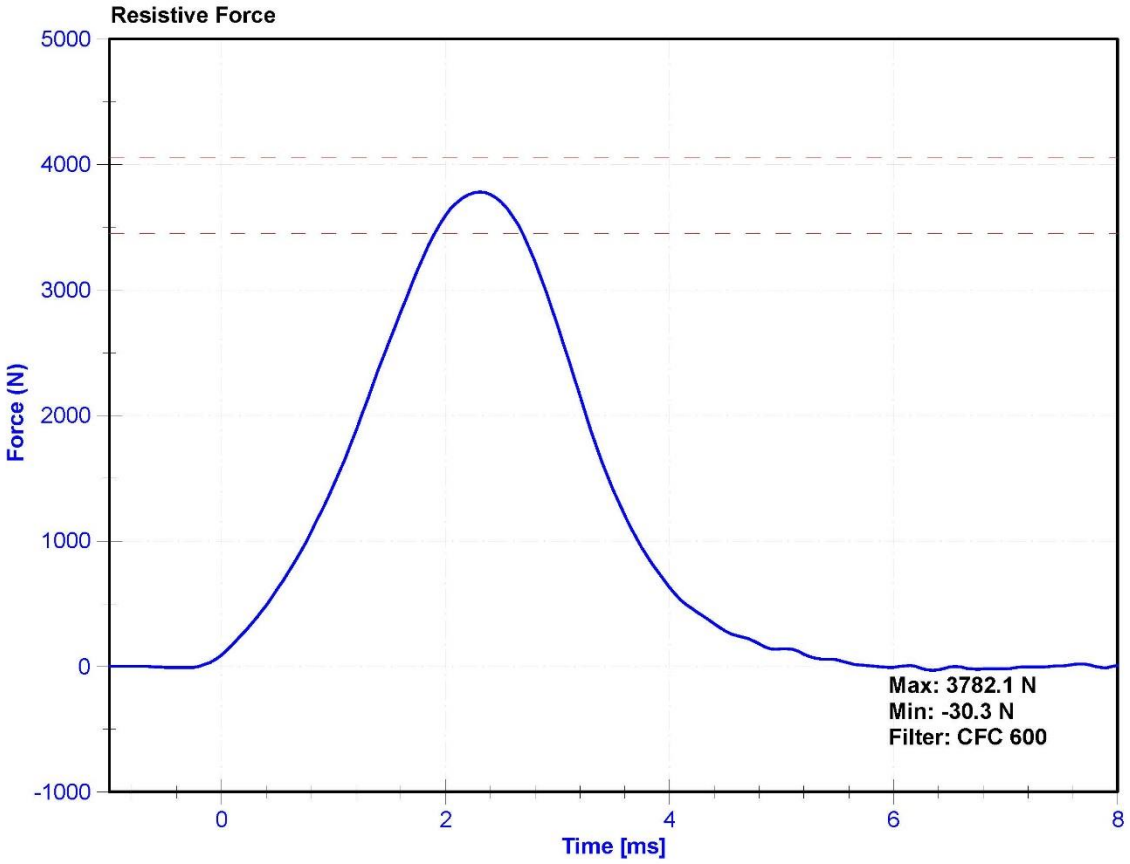
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

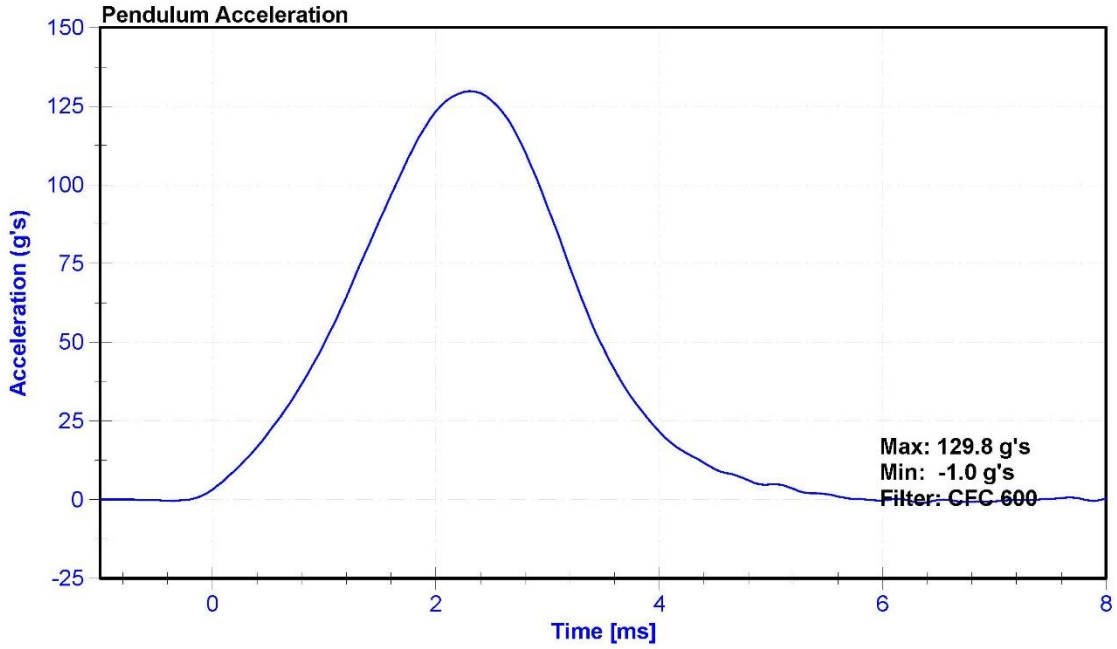
Results

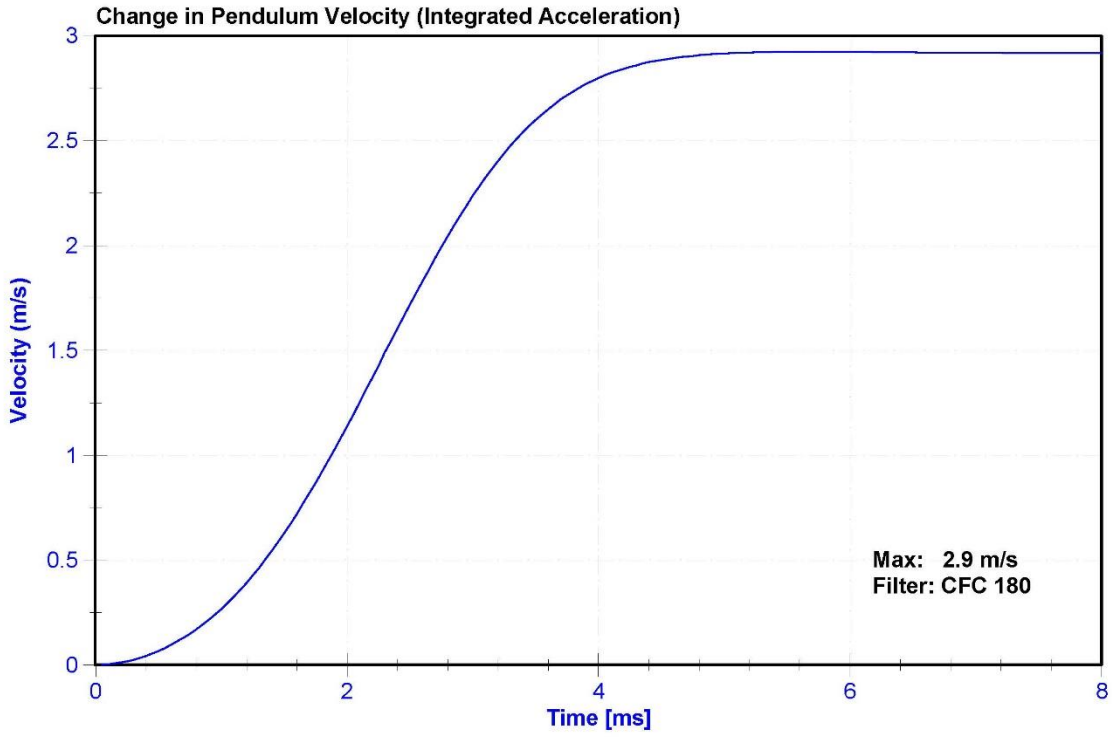
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	30.0	Pass
Velocity	2.07	2.13	m/s	2.076	Pass
Resistive Force	3450	4060	N	3782.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 129.8 g's
Min: -1.0 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.9 m/s
Filter: CFC 180

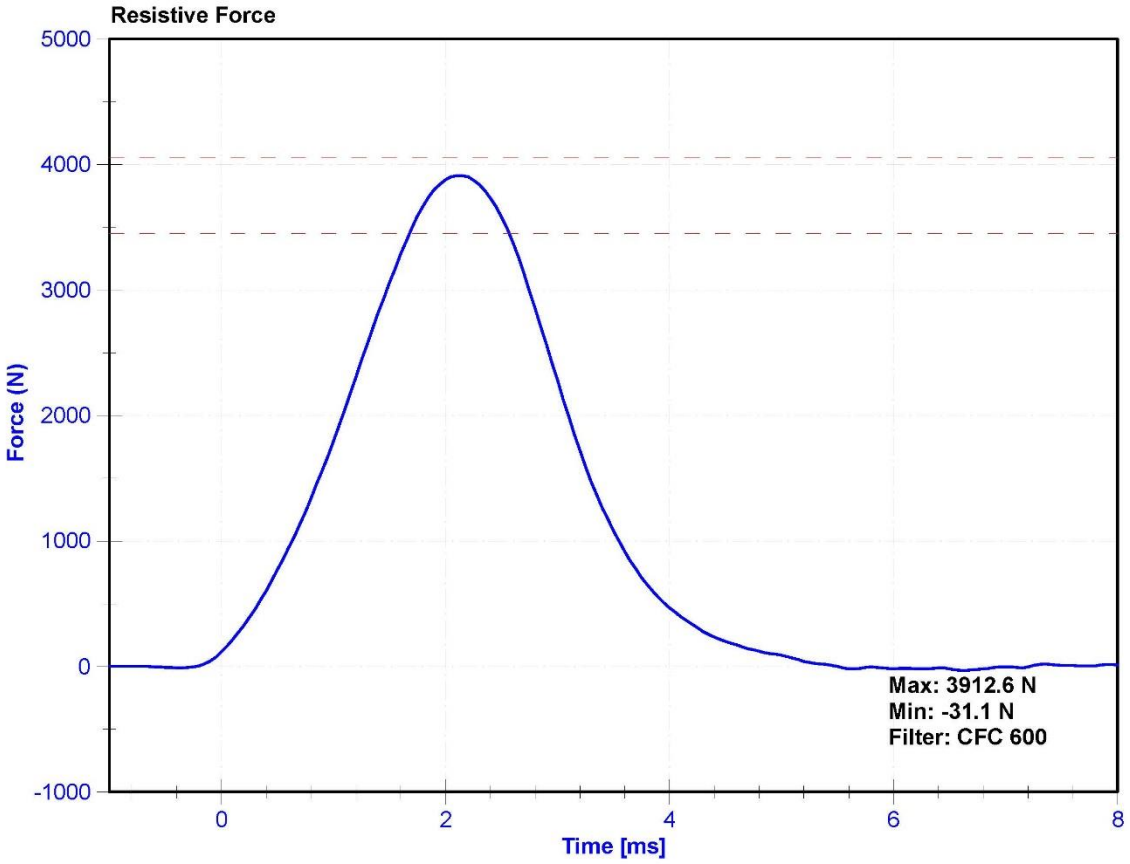
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

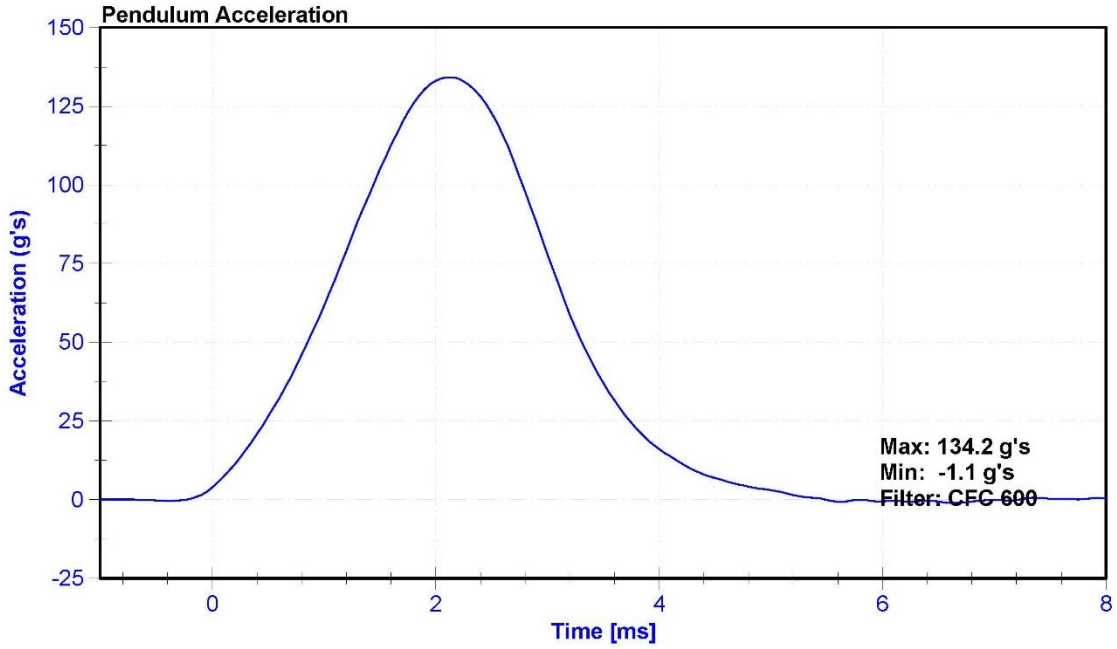
Results

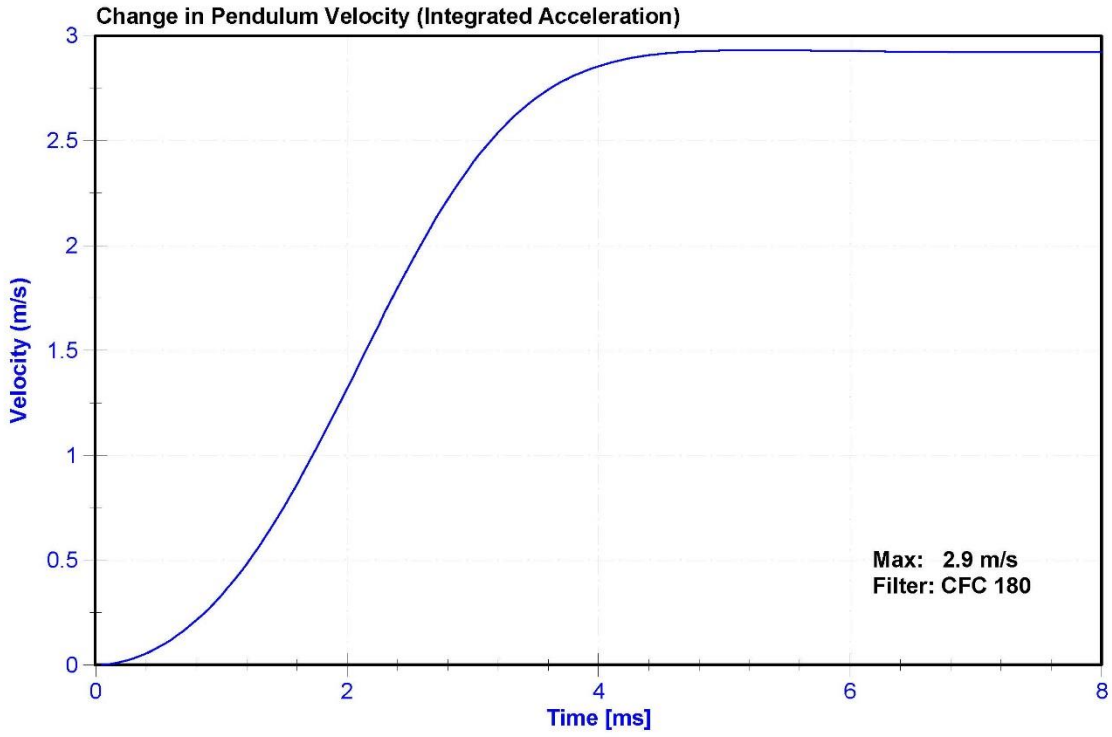
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	30.0	Pass
Velocity	2.07	2.13	m/s	2.078	Pass
Resistive Force	3450	4060	N	3912.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 134.2 g's
Min: -1.1 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.9 m/s
Filter: CFC 180